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A PRELIMINARY REPORT ON CONTINUOUS IRRADIATION OF THE ENTIRE BODY¹

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THE purpose of this paper is to present a new method of X-ray therapy consisting of continuous irradiation of the entire body at long distances from the tube. The following considerations have led the writer to the belief that this method may prove valuable in the treatment of certain types of neoplastic diseases:

1. As stated in the law of Bergonié and Tribondeau (1), "Immature cells and cells in an active state of division are more sensitive to the X-rays than are cells which have already acquired their fixed adult morphologic and physiologic characters."

A corollary of this law is that treatment should extend over a period sufficiently long to include the various times of mitosis of all the cells of the tumor. Under these conditions, it is supposed that, although a low intensity of radiation is necessitated by the long treatment, the dose received by the cancer cell at the time when it is most sensitive nevertheless is sufficient to destroy it or arrest its growth.

2. Dr. Ewing (2), in his Caldwell Lecture, states: "It is no longer possible to maintain that the body furnishes no aid in radiation therapy . . . Effective irradiation

excites a favorable reaction on the part of the body as a whole. The nature of this reaction is complex and the factors are largely unknown. It is probably of much importance in the cure of malignant tumors by radiation." He further states, "The immediate improvement in health and strength in leukemic subjects following irradiation suggests some such action."

The biologic work of Kok and Vorlaender (3) and of Caspari (4) shows the importance of generalized body irradiation in that a considerably smaller part of a skin erythema dose is required to cause tumor regression than is necessary for equal regression of tumors treated locally. Similarly, the work of Murphy and Nakahara (5) shows that irradiation of the entire body of cancer mice stimulates a defense mechanism against cancer invasion.

3. Physical considerations demand as an ideal the most uniform distribution of radiation throughout the tissues undergoing treatment. Uniformity of distribution is necessary in order to take full advantage of the relative radiosensitivity of normal and neoplastic tissues.

4. Certain types of neoplastic diseases, which tend to become widely disseminated early in their course, cannot be controlled effectively by the usual local treatments. Since the early stages of such dissemination are often unrecognizable, and since the ear-

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²Dr. Heublein passed away before proof of this paper could be submitted to him. It has been read by his friend, G. Failla, D.Sc., of Memorial Hospital, New York City. A sketch of Dr. Heublein's life and work will be found in the May, 1932, issue of RADIOLOGY.

liest possible treatment of metastases offers the best chance for their control, it appears that the greatest hope of success in treating these cases lies in the irradiation of the entire body.

A practical method of treatment, based on the above considerations, involves the prolonged irradiation of the whole body with very hard X-rays at long target-skin distances. The question of the optimum duration of treatment immediately arises. While very little is known about this, we may, perhaps, get some information from experience in the usual radiation therapy.

In radium therapy, prolonged irradiation of low intensity is usually necessitated by the small quantity of radium available. In the use of permanent gold implants, where the major portion of the dose is delivered over a period of two weeks, the good results obtained may be attributed, at least in part, to the long irradiation time. Regaud, who has stressed the value of prolonged irradiation by means of needles of small radium content, recommends a treatment lasting about one week.

In roentgen therapy, at the Radium Institute of the University of Paris, divided treatments are used over a period of about three weeks. Pfahler's saturation method may be regarded as a variant of this technic. Twenty-five years ago, satisfactory and permanent results were obtained in the treatment of superficial skin neoplasms when small divided X-ray dosage, over long periods of time, was the only method of irradiation known. In the absence of any more definite information, it would appear that, in the method of continuous irradiation of the whole body, the duration of treatment should be between one and three weeks, at least in the beginning.

In the choice of the radiation to be used, one is limited by the X-ray tubes which can be obtained readily. For continuous operation, it is preferable not to run the tube at

its maximum rated capacity. At 185 K.V. and 3 ma., ordinary tubes work very well. With a filter thicker than 0.5 mm. of copper, the radiation is hard and quite homogeneous.

In order to obtain a nearly uniform distribution of radiation throughout the body, the target-skin distance should be long, in comparison with the thickness of the body. For the economic utilization of X-ray equipment it is desirable to treat several patients simultaneously. These two requirements can be met by having several patients in a room so planned that all are farther than 5 meters from the tube. To secure the desired prolongation of continuous treatment to one week or longer, at the same time restricting the dose to a safe amount, it is necessary to adjust the intensity of radiation received by the patient to the proper value. This can be done by a suitable choice of filter and distance, other conditions remaining constant.

Irradiation of the entire body with hard rays and at a very long distance, so that all parts of the body receive nearly the same dosage, is a new procedure. Simultaneously irradiating the entire hematopoietic and reticulo-endothelial systems, as well as the various glands of internal secretion, might lower the patient's vitality. Since the tolerance doses under these conditions are unknown, if we attempt to apply the above principles it is necessary to proceed cautiously. In the past, all portions of the body have been heavily irradiated in sections, without serious permanent damage being observed. It is a different matter, however, to irradiate them all simultaneously. Nevertheless, there must be some safe dose, tolerated by the whole body, which may be sufficient to produce beneficial results. Very radiosensitive tumors, one would expect, could probably be controlled by such a dose of radiation, acting directly upon the tumor cells. The more resistant tumors might

conceivably be controlled by an unknown, indirect mechanism, such as some influence on glandular structures, the circulating blood, the reticulo-endothelial system, or possibly the tumor bed, together with direct effect on the tumor cells, whereas either mode of action alone might not be sufficient to cause regression.

Reports have appeared in the recent European literature referring to *intermittent* treatment of the entire body or prolonged treatment of parts of the body. These reports, which are also encouraging as to the results that may be hoped for, may serve as a guide in deciding the dose to administer with the new procedure.

Tomanek (6) reports a case of myelogenous leukemia which responded brilliantly to prolonged irradiation of the spleen by means of the continuous application of radium for a period of three weeks. The patient, who had ceased to respond to small divided doses of X-rays, was in the terminal stage of the disease when continuous irradiation was begun.

Fuhs (7) has been using roentgen irradiation of the entire body in long continued or resistant dermatoses, with promising results.

In skin tuberculosis, Thedering (8) has used a "roentgen bath," combined with the usual therapeutic measures. He has reported satisfactory results.

Teschendorf (9) has irradiated the entire body in various forms of leukemia and in malignant granuloma. He has noted greater remission periods in these diseases than by using small ports in the ordinary way.

Chaoul and Lange (10) reported promising results in their treatment of Hodgkin's disease with generalized roentgen irradiation in weak doses. Twelve advanced cases so treated showed restoration of the patients to their full working capacity. Of these, 80 per cent have remained free from recurrence on an average of about two and one-

half years. The remaining 20 per cent died of intercurrent disease after intervals of from eight months to two and one-half years.

In the chronic, slowly developing forms of Hodgkin's disease, Schwarz (11) obtained excellent results with small protracted roentgen-ray dosage, giving from 8 to 10 treatments in 14 days. Finding that massive dosage given in one treatment had very little effect, he explained this by the hypothesis that a large number of cell areas may, at a given time, be in a condition of metabolic inactivity and, consequently, have a very low radiosensitivity. He concluded that small doses given over a protracted period have a greater chance to catch all the cells at the best moment for their destruction.

Frimann-Dahl and Forsberg (12) used interrupted dosage directed to the entire body in the leukemias, with the head, neck, and genitals screened. The exposures were from 12 to 18 minutes at one meter distance. They delivered from 0.1 to 0.8 of an erythema dose in a period of from four or five days to five weeks, using daily exposures. These authors maintain that general irradiation is superior to local roentgenotherapy because it is more lenient, enabling the patient to keep up his work longer.

For several years, the author has had in mind the practical application of the above-mentioned method of radiation therapy. The problem, however, requires intensive study of its different aspects, which can be best carried out in a well-organized cancer center. For this reason a co-operative arrangement was made with the Memorial Hospital, of New York, to initiate the work under the proper auspices. The necessary equipment was installed in May, 1931. The clinical work has been conducted under the direction of a special committee of the Hospital on experimental roentgenotherapy in co-operation with the author.

The X-ray machine employed was spe-

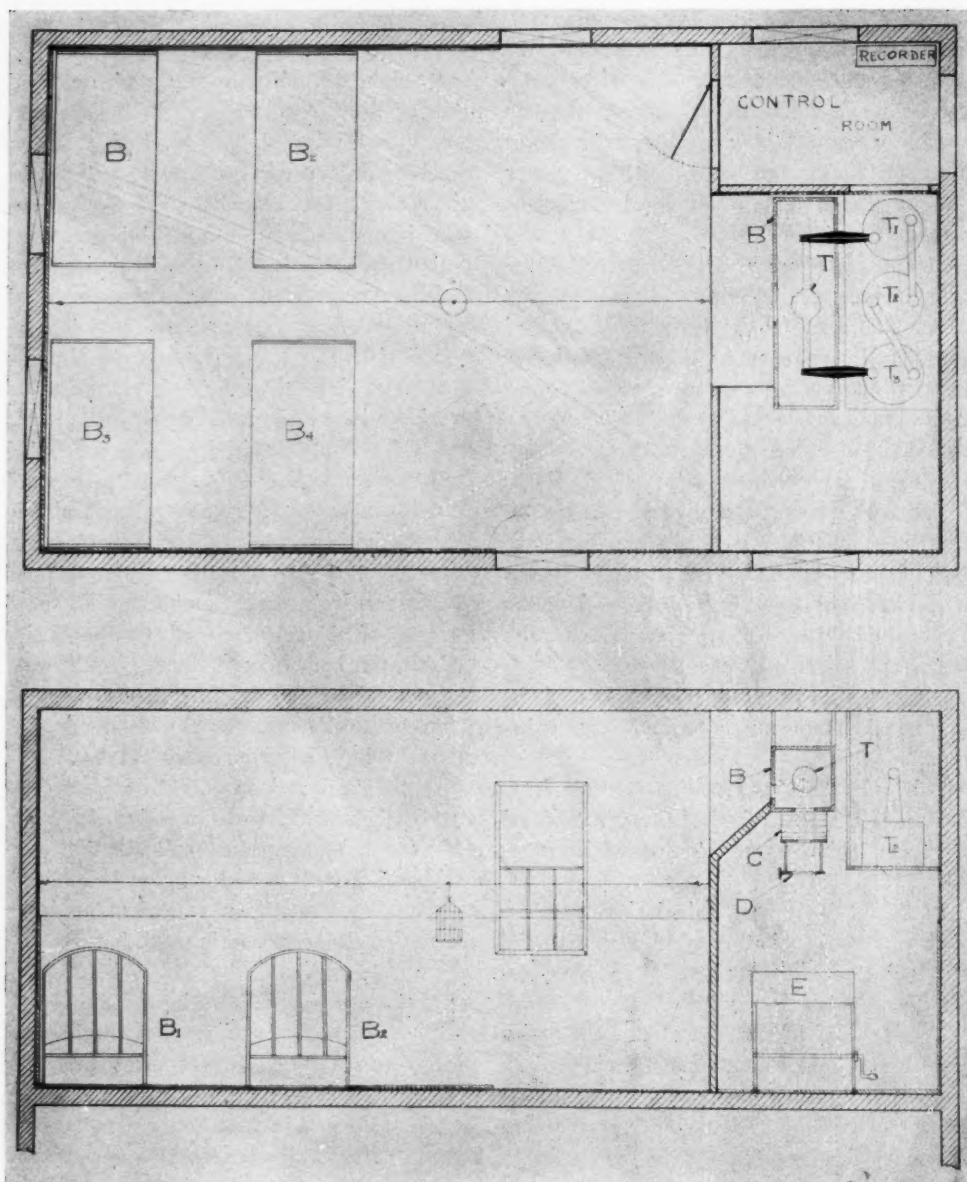


Fig. 1. A schematic drawing of the lead-lined radiation ward. Here, with a single X-ray tube, irradiation of the entire body at long distances, as well as interrupted treatment at shorter distances, may be carried on continuously.

cially designed according to specifications drawn up by Dr. G. Failla. It is silent and automatic, and permits the continuous operation of a roentgen tube, day and night,

except for such time as is required for the necessary nursing care of the patients. In practice, we have found that the machine operates approximately 20 out of the 24

hours. This apparatus requires no X-ray technician to operate it, and the attending nurses are protected from exposure to X-rays by an automatic cut-out switch, which stops operation of the tube as soon as the door of the treatment room is opened. The time that the machine is shut down is automatically registered. A graph indicates the intensity of X-radiation emitted at all times. The machine, which has been in constant operation since May, 1931, has required practically no attention.

Our first X-ray tube, the old Coolidge deep therapy type, ran 768 hours before breaking down. A new type Coolidge therapy tube with hard glass was substituted. This has operated continuously up to November 5 for 2,161 hours, and is still functioning perfectly. The current consumption has been 26 kilowatt-hours per day, entailing an expense of from \$1.00 to \$1.25.

With one Coolidge tube, five patients are simultaneously irradiated, four continuously at long distances, and one at comparatively short range, 150 centimeters. In the main ward in which there are four beds, the average distance to the far beds is 732 cm., approximately 24 feet, and, to the two near beds, 548 cm., approximately 18 feet. The time required to administer a given dose, kilovoltage and milliamperage being constant, depends upon the thickness of the filter and the distance employed. Up to the present, several different dosages have been used with varying irradiation times. The tube has been operated at 185 K.V. and 3 ma., so far. With a filter of 2 mm. of copper, the intensity of radiation at the near beds is 1.26 r per hour; at the far beds, it is 0.68 r per hour, measured in air. Accordingly, to deliver 25 per cent of an erythema dose (that is, 25 per cent of 750 r), a patient in a near bed must be irradiated for 149 hours (or about 7.5 days at 20 hours a day). To receive the same dos-

age a patient in a far bed must be irradiated for 278 hours (or 13.9 days at 20 hours a day). Initially, a much heavier filter (5 mm. copper) was employed in order to reduce the intensity of radiation, so that smaller percentages of an erythema could be administered without reducing the time factor.

Although the lethal X-ray dose for a canary is unknown, on May 26, one was placed in a cage in the X-ray room with the patients, one-half the distance to the far beds. This was done to give an indication of the possible harmful effects of prolonged irradiation. Up to November 5, this canary had received a total of 5,000 r, or 6.3 skin erythema doses. A second canary, used as a control, was placed outside the X-ray beam, receiving only a small amount of scattered radiation. Both are still alive and are apparently in as good condition as when we started.³

As this work is largely experimental, it has been necessary to proceed with the utmost caution and to increase doses slowly, starting with 5 per cent of a skin erythema and gradually increasing to 30 per cent. This dose will be increased from time to time, if no harmful effects are observed.

It has been our feeling that beneficial effects might be hoped for in the following groups of cases:

1. The leukemias
2. The lymphomas
3. The radiosensitive carcinomas.

At first, however, the main purpose was to establish a dose the entire body could safely tolerate. Accordingly, cases which one would expect to influence favorably by any of our present well established methods of treatment were excluded. All patients receiving treatment by this method presented a wide dissemination of their disease. Many had radioresistant tumors.

³The first canary died later, after receiving about 7 erythema doses. At autopsy it showed marked radiation changes.

From the latter part of May, when the first patient was placed in the X-ray ward, until the middle of October, 20 patients were treated at long distances. The doses delivered varied from 5 to 30 per cent of an

Following the first course, in which 8.7 per cent of an erythema dose was delivered, the patient showed improvement, evidenced in the regression of his nodes and a feeling of general well-being. Three months later, he

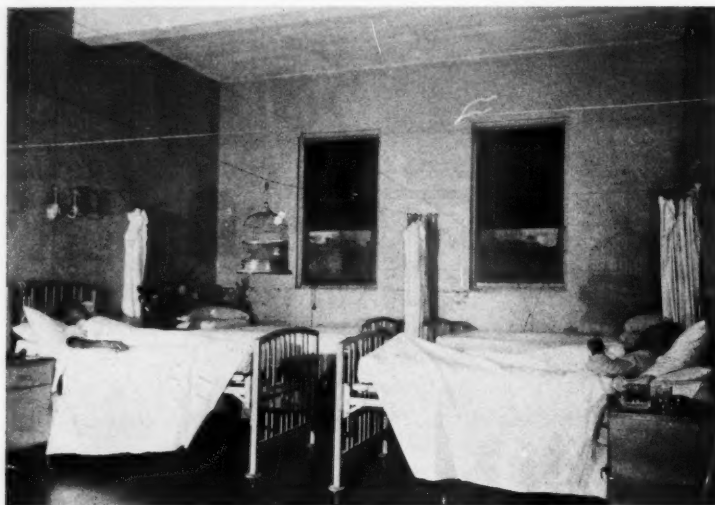


Fig. 2. Photograph of the ward for continuous irradiation of the entire body at long distances.

erythema, only one receiving this latter dose. Of the 20 patients treated at long distances, 12 are classified in the radiosensitive, and eight in the radioresistant group.

RADIOSENSITIVE GROUP

1. Two cases of lymphosarcoma
2. Four cases of Hodgkin's disease
3. Six cases of leukemia
 - (A) One myeloid
 - (B) Two lymphatic
 - (C) Three lymphatic pseudoleukemia

Two of the patients in this group showed distinct improvement and a third was moderately benefited.

IMPROVED CASES (RADIOSENSITIVE GROUP)

A patient with widely disseminated lymphatic leukemia, with a mass in the abdomen, received two courses of treatment.

was admitted for a second course of treatment, receiving at this time 16.3 per cent of an erythema dose, a total of 25 per cent of an erythema dose for both courses. This patient showed satisfactory progress as far as a general feeling of well-being was concerned, a gain in weight, and almost complete regression of his nodes.

A patient having Hodgkin's disease with widely distributed nodes and a mass in the abdomen, who received 15 per cent of an erythema dose over a period of 253 hours, showed distinct improvement in general well-being. The nodes regressed appreciably in size and the patient gained in weight.

A patient, having lymphatic leukemia with widely distributed nodes and a mass in the abdomen, received 15 per cent of an erythema dose. This was followed by a general improvement in well-being and diminution in the size of the nodes, although the mass

in the abdomen became slightly larger. The patient was able to resume work.

UNIMPROVED CASES (RADIOSENSITIVE GROUP)

Five patients were unimproved: one with lymphosarcoma, one with lymphatic leukemia, one with Hodgkin's disease, one with lymphatic pseudoleukemia, and one with myeloid leukemia. The first four received, respectively, 5.4, 5.9, 15.2 and 15 per cent of an erythema dose. The patient with myeloid leukemia, who received 15 per cent, has been too recently treated for us to draw any conclusions.

The remaining four patients in this group died: one had subacute Hodgkin's disease; one, chronic Hodgkin's disease; one, a lymphatic pseudoleukemia, and one lymphosarcoma. They received, respectively, 5.6, 6, 10, and 25 per cent of an erythema dose. The deaths in these cases could not be directly attributed to this therapeutic procedure. One died of bronchopneumonia, and three of the natural progress of their disease.

RADIORESISTANT GROUP

There were eight patients who were treated at long distances. Two showed symptomatic improvement.

A patient who had an adenocarcinoma of the breast, with metastases to the lungs and lumbar spine, received 15 per cent of an erythema dose. In this case there was considerable relief from pain caused by bone metastases.

A patient who had carcinoma of the breast with widespread metastases to the lungs, lumbar spine, and pelvis received 15 per cent of an erythema dose, resulting in relief from pain caused by bone metastases.

Of the unimproved patients, there were three who had metastatic carcinomas of the breast. One received 8.4 per cent of an erythema dose and two received 15 per cent.

The fourth patient, who presented metastatic melanoma, received 30 per cent of an erythema dose. However, he has been treated too recently to permit one to draw any definite conclusions.

The other two patients in this group died. One had a widespread metastatic squamous-cell carcinoma of the left renal pelvis and died of coronary thrombosis. The other had a carcinoma of the breast with metastases to the lung. They received 6 and 15 per cent of an erythema dose, respectively.

A thorough physical examination, tumor measurements, basal metabolism estimate, blood pressure, and routine urine examination are made on all patients treated by the continuous method before they are admitted to the treatment ward. Special laboratory tests are as follows:

1. A biopsy specimen
2. Blood Wassermann
3. Blood calcium
4. Blood phosphorus
5. Blood sugar
6. Non-protein nitrogen
7. Blood CO₂ combining power
8. Blood P_H
9. Icterus index
10. Complete blood count
11. Fragility test
12. Platelet count.

A careful follow-up system is maintained of these tests, which are made before, during, and after the treatment. In this small series, no changes attributable to the treatment were noted in any of the tests. Thus, valuable information of the tolerance dose has been accumulated, based on the general reaction of the body.

The results obtained so far, with the continuous long distance method of treatment, are not striking, but some definite evidence of improvement has been noted, particularly in the patients with radiosensitive neoplastic disease who have received the higher dosages. In this connection, it should be noted

that the maximum total dose administered so far is probably too low, since it has produced no detectable blood changes. Furthermore, all the patients selected for this

mode of treatment have been in the advanced stages of their diseases. Accordingly, it is desirable to continue the experiment and to increase gradually the total dose

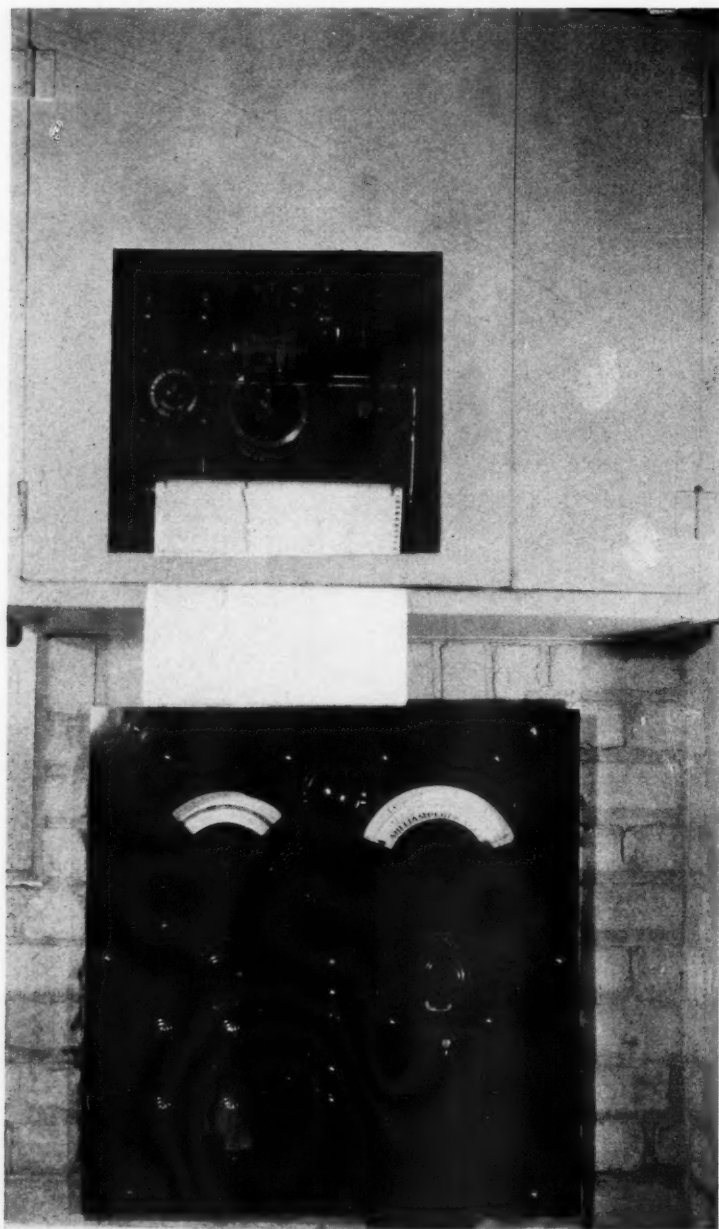


Fig. 3. Panel board of X-ray control and recording meter.

administered. With proper precautions, this can be done without danger of exceeding the safety limit.

In order to utilize the X-ray machine to its full extent, a treatment table was placed beneath the tube in a separate room. Here patients received intermittent treatments at 150 cm. distance through ports 27 cm. in diameter, or smaller, if desired. The X-ray beam is filtered through 1 mm. copper and 4 mm. aluminum. As the intensity delivered is 30.6 r per hour, it requires 24.5 hours to deliver 750 r. Two ports cover one side of the entire torso. The depth dose at 10 cm. with this field is 58 per cent.

At this shorter distance (150 cm.), 10 cases were treated with interrupted dosages, delivering 61.2 r through each of two ports daily until a total of from 750 to 1,000 r to each port had been attained. The time consumed is approximately from 12 to 24 days.

A total of 10 cases, four radiosensitive and six radioresistant, were treated as follows:

Radiosensitive Group.—1. A patient who had a recurrent teratoma testis, who has received prophylactic radiation directed to the abdomen, has remained well for four months. Previously radium had been used for recurrences in the scar, causing their complete regression.

2. A patient with recurrent teratoma testis with a large mass in the abdomen, which resisted high voltage treatment one month before the present treatment, showed complete regression of the tumor. He has remained well for four months.

3. A patient with a very extensive Grade IV carcinoma of the neck of the urinary bladder, with metastases to the lung, showed complete regression of the tumor masses in the lung in six weeks from the beginning of the treatment. There was also marked improvement in the size of the bladder tumor, which has regressed to one-third its former size. This patient received 800 r to

the chest and abdomen anteriorly and posteriorly so that the whole torso was covered. A second course of treatment is now being given. When admitted for treatment, this patient appeared to be in a terminal stage of his disease and received repeated blood transfusions. In spite of his generally bad condition, the tumor regression has been most satisfactory.

4. A patient who exhibited an advanced lymphosarcoma with metastases to the pubic bones, to the nodes, and mediastinum, showed no distinct improvement.

Radioresistant Group.—1. No improvement was noted in an adult type teratoma testis with widespread metastases to the lung and abdomen.

2. Two carcinomas of the urinary bladder, Grade II, showed no regression after receiving 1,000 r anteriorly and posteriorly.

3. A carcinoma of the cardiac end of the stomach showed no improvement. This diagnosis was based on clinical and X-ray findings only.

4. A primary Grade II carcinoma of the lung showed no improvement.

5. A hypernephroma with metastases to the lungs showed no improvement.

To date the results with the short distance intermittent technic, while more striking than the long distance method, may be accounted for by the greater total dosage delivered. The number from which to draw conclusions, however, is too small.

SUMMARY

1. Theoretic considerations and practical observations led the author to the conclusion that it is desirable to test the value of prolonged continuous irradiation of the entire body in certain types of neoplastic diseases.

2. At the Memorial Hospital, an automatic X-ray machine is in use in a special lead-lined ward in which four patients may be simultaneously and continuously irradi-

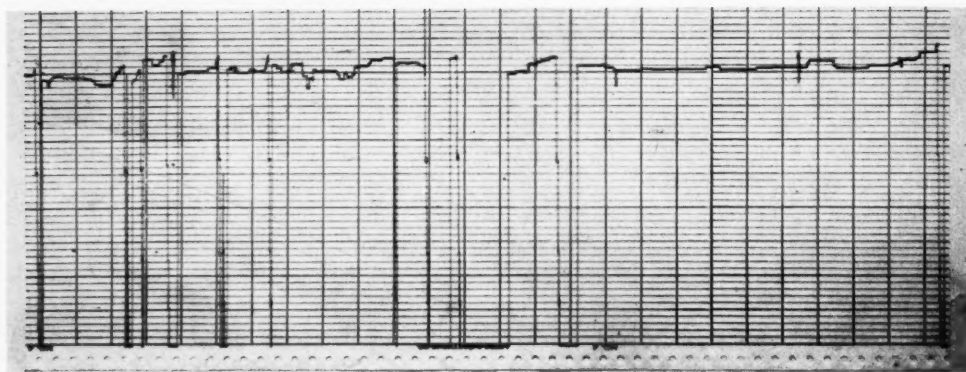


Fig. 4. A graph indicating the intensity of X-rays emitted, as well as the periods and length of time of interruptions in the treatment.

ated. In addition, provision has been made for the administration to other patients of local intermittent treatments at a target-skin distance of 150 cm., making use of the same X-ray tube. This machine is dependable and economical in operation.

3. The cases selected for the long distance irradiation method are well advanced, and many present widely disseminated lesions. This choice is made primarily to establish a tolerance dose for the entire body, and in the hope of observing some beneficial clinical manifestation, such as a stimulation of some defense mechanism against malignant disease.

4. The maximum dose which the entire body will tolerate has not yet been established. However, investigations to determine this dose are being carried on. At present, we believe that 25 per cent of a full erythema dose of 750 r measured in air, delivered at the rate of 1.26 r per hour, is a safe dose. Clinical observations and extensive special laboratory tests confirm this opinion.

5. To date, no pronounced beneficial clinical manifestations have become evident, although in some instances encouraging improvement has been noted. It is too early

to say whether or not a favorable systemic effect has been, or can be, produced by this method.

6. With intermittent local treatment at 150 cm., definite regressions have been noted in the radiosensitive group of cases.

7. The number of cases in both groups is too small to permit any definite conclusions at this time, although it is believed that the evidence accumulated thus far fully warrants the continuation of the experiment with increasing dosage, within safe limits.

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DISCUSSION

DR. L. F. CRAVER (New York City): I would emphasize three points in connection with this work. They are: the method is new; it appears to be safe, within limits, and it appears to be valuable.

When this method was first proposed to us at Memorial Hospital, it encountered a feeling of considerable skepticism and uncertainty. So many biologic factors are involved about which little is known that we felt obliged to begin with very small doses and to proceed cautiously, watching the condition of the patients carefully. Particularly we made frequent counts of the blood cells and blood platelets, together with numerous other laboratory tests, so that, as far as possible, we might avoid exceeding the body tolerance dose. It should be emphasized that, up to the present time, our selection of patients for this form of treatment has been purposely restricted to those whose prognosis was hopeless with any other form of therapy.

We began seven months ago with 5 per cent of a skin erythema dose, and have found ourselves able to increase this gradually by successive steps to 10, 15, 25, 30, 40, and even 50 per cent. To our surprise, frequently repeated blood counts and other tests have, in all instances, failed to show any consistent change that could be ascribed to radiation effect, except in the leukemias, in which the usual decrease in the number of white cells has occurred. There has been no instance of marked drop in blood platelets nor has purpura hemorrhagica occurred in any case.

As to changes in the menstrual function, only three women were below the menopause age. One of these was a young woman with generalized Hodgkin's disease, in whom the menses had been suppressed for several months before she was treated. In her case, apparently the disease itself had caused the amenorrhea. The other women who were still having menstrual periods have been treated too recently to permit observations as to the effect of the treatment on this function. No attempt has been made to shield the eyes, hair of the scalp, or genitals.

To sum up, then, the safety of the method,

we feel certain that, with doses up to 50 per cent of a skin erythema, delivered to the entire body with the factors of distance and filtration which we are using, no deleterious effects have been detected. How much further we can increase the dose we do not know. That is the part of the problem that lies immediately before us.

The method promises to be valuable. Thus far, 27 patients have been treated. There were 15 in the radiosensitive group, and 12 in the radioresistant group. The radiosensitive group comprised one case of myelogenous leukemia, three of lymphatic leukemia, four of pseudo-leukemia, five of Hodgkin's disease, and two with lymphosarcoma. In the radioresistant group there were five with carcinoma of the breast with metastases to the bones or lungs, or both, one with squamous carcinoma of the renal pelvis with extensive lymph node metastases, one ovarian carcinoma with extensive lymph node metastases, three of metastasizing melanoma, and one with widespread metastases in the bone from a prostatic carcinoma.

Four of the patients in the radiosensitive group died, all, we believe, of the natural progress of the disease. Three patients in the radioresistant group died, one of acute cardiac failure, the other two of the natural progress of the disease. None of these deaths, so far as we could see, could in any way be ascribed to the effects of the treatment.

We have noted some distinct beneficial effects, particularly with the larger doses. Two of the patients with metastasizing cancer of the breast involving bones had relief from pain. The patient with metastasizing prostatic carcinoma, who received recently a 50 per cent dose, has had considerable relief from pain, accompanied by a distinct improvement in general condition.

It is particularly in the radiosensitive group, however, that we have, in some instances, seen striking improvement. One recent case—pseudo-leukemia, with generalized lymphadenopathy and bilateral parotid and temporal tumors—showed regression while under treatment. This regression has continued and the patient is markedly better in general condition.

One young man, with Hodgkin's disease, showed good regression of nodes and a gain in weight. One patient with pseudoleukemia, who early in the course of the work had received, without improvement, a dose of approximately only 8 per cent, was later brought back to receive enough additional treatment to bring the total dose up to 25 per cent. With this dose his improvement has been definite. Another patient with lymphatic leukemia, who received 15 per cent, has improved sufficiently to be able to return to work.

DR. G. FAILLA (New York City): I can add little to the present discussion, because it is almost entirely a question of the dose which patients can tolerate under these conditions.

As far as the machinery is concerned, I may say that it is very simple, requires little attention, and has given us practically no trouble. We made a large ionization chamber in order to produce a current large enough to operate a Leeds and Northrup recorder. In this way we obtain a graphic record of the intensity of radiation used during a treatment and the intervals during which the machine was shut down. Furthermore the chart enables us to tell at a glance how the machine is functioning at any time, and particularly dur-

ing the night when no technical help is available.

I am very much interested in the experiment, however, on account of its relation to the problem of differential action we have been studying in the laboratory. The prolongation of the time during which the radiation is administered is one of the factors which may influence favorably the relative radiosensitivity of pathologic and normal tissues. That is, the prolonged treatment may make it possible for the normal tissues to receive, without injury, a dose of radiation which at the same time is injurious to the pathologic tissues. It is too early to say whether or not such is the case in this experiment, but the results are encouraging.

DR. HEUBLEIN (closing): One of the interesting observations made in this experiment is that, with the administration of amounts of radiation ranging from 5 to 25 per cent of an erythema dose to the entire body, there has been no depression in the number of white cells. The white cell count is known to be a very sensitive index of radiation effect. Nevertheless, definite regression of some tumors has been observed with such small doses as we have administered.

X-ray Tubes at High Voltages.—Prof. C. C. Lauritsen, of the California Institute of Technology, has discussed the working of the 900,000 volt X-ray tube with which it is hoped soon to attempt biological applications. Dr. Lauritsen produced the high voltage by means of transformer as in the conventional X-ray tube operation, whereas Dr. M. A. Tuve, of the Carnegie Institution of Washington, uses a form of Tesla coil with which higher voltages are possible. Dr. Lauritsen's rays are more intense and dangerous to the worker.

Dr. W. D. Coolidge, in discussing the difficulties encountered in designing X-ray tubes for operation at these high voltages, has said that a great reduction in both space and electrical hazard is possible by operating both the tube and the high voltage source immersed in oil. No portion of the high voltage circuit will be exposed to the air. The glass used for the tube should be free from the elongated bubbles found generally in drawn glass tubing.

—*Science Service.*

CANCER IN THE YOUNG

By M. J. SITTENFIELD, M.D., NEW YORK

THE popular conception of a definite cancer age has overshadowed the actual fact that cancer occurs quite frequently in the young. The occurrence of cancer in childhood has been distinctly underestimated and its rarity very much exaggerated, an attitude which really accounts for its scanty mention by most writers. It is my belief, however, that much more attention should be accorded this chapter of malignancy, both by the cancer student and also the clinician. For example, when isolated cases of cancer in the young are reported in the literature, it is surprising to note that these neoplasms are described usually in the terminal stage, or at a period when widespread metastases compel recognition, especially tumors which belong to certain well defined groups. Obviously a great many are overlooked, because it is the common experience that when a single neoplasm in a child is reported, within a comparatively short time a surprisingly large number of similar cases are described.

In a survey of cancer in the young, it is particularly noticeable that writers who have given much thought to this subject generally record a remarkably large number of cases.

Cushing (1), for instance, cites that out of 1,108 cases of intracranial tumors in his service at the Peter Bent Brigham Hospital, in Boston, from 1913 to 1926, 20 per cent occurred during the first two decades of life. He further states that half of these tumors should have been diagnosed at the bedside, and postulates, in his series, a definite clinical syndrome. He suggests that the recognition of certain well defined symptoms should point the way to early diagnosis.

Leavitt's report (2) of 350 cases of brain tumors, from the records of the Philadel-

phia Hospitals, states that clinically only 23 were recognized in children. He explains, however, that many brain tumors were not diagnosed clinically and believes that the larger proportion in Cushing's series was due to the greater "tumor consciousness" on the part of the examining staff at the Boston Hospital.

Tooth (3) analyzed 500 intracranial new-growths verified either at operation or post-mortem examination at the National Hospital in London, over a period of ten years, and determined that 139, or 27.8 per cent, were in individuals from one to twenty years of age.

A similar condition of affairs exists in malignant growths of the spinal cord. For example, in a collection of 251 tumors of the spinal cord from autopsy records, Schlesinger (4) found 60 tumors, or nearly one-fourth, in children under fifteen. In this series, 33 occurred before the age of nine, and 27 between the ages of nine and fifteen.

Quite in keeping with this is the frequency of neuroblastomas of the suprarenals and tumors about the kidney. The studies of Warner (5), Wollstein (6, 7), Sturtevant and Kelly (8), Kwartin and Twiss (9), Bendixen and Lamb (10), and others, indicate that nearly 20 per cent of all tumors in childhood are renal tumors. It is particularly noticeable that the greatest proportion of these tumors occur in the first five years of life, and are not so common after the fifth year.

Primary carcinoma of the liver is another group not uncommon in children, according to Rosenbusch (11), who collected 32 cases, of which 20, or nearly two-thirds, were in children under five years of age.

Aside from the tumors just mentioned, sarcomas of the ovary in the young are not

infrequently encountered. Downes (12) reported 26 cases of ovarian tumors in children, aged less than ten years, and of these 16 were malignant tumors. On the other hand, the Mayo Clinic reviewed 564 malignant tumors of the ovary operated upon from 1916 to 1926, and found only 5 in young persons less than twenty years of age. Doran (14) cites one in a seven-months fetus, and one in an infant twenty-two months old. Recently Hunt (15) has described a carcinoma of the ovary in an infant seventeen months old.

Quite a number of carcinomas of the stomach and intestines are detailed in the literature. Uhlhorn (16) gathered 69 cases of cancer of the rectum in children under fifteen. So, too, newgrowths of the internal secretory glands as the thyroid, thymus, pancreas, prostate, etc., are described by Calvin (17), Slesinger (18), Lacquiere and Bouchard (19), and a host of others. Sarcomatosis in the skull and chest have been reported by Lattes (20), Peacock (21), and others. Parker and Stokes (22), in 1925, published reports of ten intra-ocular sarcomas in children which occurred in their own practice.

From this brief outline of the occurrence of neoplasms in the young it is increasingly evident that they are not as rare as one would assume, and the reason that they are not more frequently diagnosed is due, perhaps, to a lack of concentrated effort. Referring again to Cushing's series, 213 of which occurred during childhood, it would seem that, if these brain tumors in children were more carefully tabulated, other observers might find similar conditions.

As a general survey, then, let us consider briefly the most frequent types of neoplasms in children in order to project and stress the outstanding features and thereby facilitate early recognition. It would serve our purpose best to classify the more common types of tumors occurring in children into the following groups:

- (1) Cerebro-spinal Tumors
 - (a) The intracranial tumors
 - (b) Those of the spinal cord.
- (2) The malignant tumors of the suprarrenal and the renal region.
- (3) Malignant tumors of the bone.
- (4) Miscellaneous group of carcinomas and sarcomas.
- (5) The lymphomas, including the blood tumors as a supplementary group.

1. CERE BRO-SPINAL TUMORS

(a) *The Intracranial Tumors.*—In this group, the symptoms express themselves in such constant and definite manner that it would appear that early diagnosis ought not to be too difficult. For example, in a child with unexplained vomiting, headache, and unsteadiness of the extremities, without nausea or digestive disturbances, in conjunction with a perceptible enlargement of the head, the clinician should be on guard to examine the eye grounds every week or two, until the presence of a tumor in the brain has either been established or ruled out.

The more common types of brain tumors in children are (a) the medulloblastomas and (b) the astrocytomas. These neoplasms make up such a large proportion of brain tumors that practically three out of four of all the intracranial newgrowths in childhood fall into this group. The medulloblastomas are essentially tumors of pre-adolescence, occurring as a rule in the midcerebellar or fourth ventricular region.

The second type, or astrocytoma, is met with nearly twice as often as the medulloblastoma. This also arises from the roof of the fourth ventricle, but differs from medulloblastoma in its comparative benignity, insofar as it grows very slowly. While the astrocytomas are also tumors of the young, a great many are encountered later in life, due perhaps to their slower rate of growth.

Next in importance to the gliomas in the

young are the congenital tumors of the brain. This group is made up chiefly of the adenomas. Generally they interfere seriously with the function of the pituitary body. Lately much interest has been manifested in this group of tumors.

While all of these tumors generally exist from early childhood, in only 20 of the 71 tumors in Cushing's series did the symptoms become recognizable before adolescence.

In 1890 Starr (23) reported a series of 300 brain tumors in children, and it is a matter of much speculation that, in his series, 50 per cent of the lesions were diagnosed as tuberculomas. Cushing, on the other hand, found these tumors very rare, only six cases being met with in his series, and assumes that this difference may be due to a decrease in tuberculosis in general. The infrequency of tuberculomas has been confirmed by other writers. Generally speaking, however, when they do occur the tuberculomas are more malignant than the true neoplasms.

(b) *Tumors of the Spinal Cord.*—In marked contrast to the brain tumors, the symptoms of the spinal tumors are not so clearly defined, even in tumors of the same segmental level. Lumbar puncture will often induce an increase in the sensory symptoms if they are already present, and this phenomenon is of great value as an aid to diagnosis. The lumbar manometric test appears to be of greatest significance, and Stookey (24, 25) is of the opinion that, in half of the cases, diagnosis would have been impossible without this test. He emphatically states that this should be the routine procedure in every spinal cord lesion.

Tumors of the spinal cord in children fall also into two groups: (a) the intra-medullary, and (b) the extra-dural.

Tumors of the intra-medullary group vary greatly in their symptomatology, as well as in their histopathology. Owing to the lack of a definite clinical syndrome,

many of these cases go unrecognized, as the bladder and rectal disturbances occur only late in the disease. The extra-medullary tumors belong either to the sarcoma or the fibrosarcoma type. The average age of the children in the intra-medullary group in Stookey's series was eleven years, while the extra-dural spinal tumors are usually encountered in children averaging three years.

2. MALIGNANT TUMORS OF SUPRARENAL AND RENAL REGION

The suprarenal tumors occurring in children have been recognized perhaps with greater frequency than the intracranial tumors. They occur anywhere from the age of three months up to puberty. In studying the clinical history of these tumors, one is impressed with the similarity of the subjective symptoms in this group of neoplasms.

Robert Hutchinson (26), in 1907, was the first to draw attention to these tumors which he called the "suprarenal sarcomas." The clinical and pathologic features of these cases run almost parallel; in the majority, the first symptom noticed is single or multiple swellings about the bones of the skull. Following, or sometimes preceding this, proptosis of one or both eyes is observed. In most of the children, discoloration of the eyelid on one side was the leading symptom, and in some instances this was the first one to attract attention. An abdominal tumor in one or the other loin was positive on palpation in about half of the children. Anemia also was a striking feature in every case. These tumors generally are highly malignant, and run a very rapid course, the duration in the oldest child being about six months.

A large percentage of these neoplasms occur in the first five years of life, and are relatively infrequent afterwards. From the suggestive symptoms it would seem that early recognition of these tumors ought to promise a better prognosis, providing they

are seen before the appearance of widespread metastases in the skull and other parts of the short bones. In a large majority of cases, the tumor should be recognized, and of greatest diagnostic value is the ecchymosis of one eye, generally on the same side as the affected suprarenal. As these growths give rise to involvement of the orbit, Sturtevant and Kelly have made it serve a diagnostic purpose, since unilateral swelling of the orbit, in their opinion, casts definite suspicion of metastases from a suprarenal tumor.

There is another type of suprarenal tumor described by Pepper (27) which is not quite as malignant as the neuroblastoma of Hutchinson. This neoplasm gives rise to rapid and progressive distention of the abdomen, without ascites, though there is jaundice, fever, and enlargement of the liver. Pepper's tumor is made up of highly differentiated cells more closely approaching the mature type, grows more slowly, and is relatively benign, in contrast to the Hutchinson type, which is very malignant.

Wollstein described 18 primary renal neoplasms occurring in children between the ages of four months and six years. Four children with a solid type of tumor survived its surgical removal ten months or more. In other words, the prognosis is not entirely hopeless, though the operative mortality is very high.

3. MALIGNANT TUMORS OF THE BONE

Only a brief discussion of this group of bone tumors is possible at this time. This subject is being studied by a special committee of the American College of Surgeons and others, but no definite report has as yet been issued. It is of interest, however, to point to a collection of 864 bone tumors by Christensen (28), in which the age of the patient was definitely ascertained, and nearly 40 per cent were under twenty. The larger number occurred in the latter half of

the second decade. Of the 376 osteogenic sarcomas, 174, or nearly one-half, occurred before the twentieth year; of the 341 giant-cell tumors, 170, or again one-half, were in persons twenty years old or less. In his series of 84 endothelial myelomas, he found that 47 were in children and that the proportion of male to female was 2 to 1.

According to his observations, 93 per cent of all bone tumors in childhood are of one of three types: (1) Osteogenic sarcomas, 48 per cent; (2) giant-cell type, 24 per cent; (3) endothelial myelomas, 20 per cent.

Multiple myelomas have heretofore been considered a disease of adult life, but in Christensen's series, 39 per cent occurred before the twenty-first year.

4. MISCELLANEOUS GROUP OF CARCINOMAS AND SARCOMAS

Only a cursory consideration can be given to this group. From what has been said before, they arise in any part of the body and require considerable amount of skill for detection. The more important, those of the liver, stomach, intestines, rectum, thyroid, thymus, ovary, etc., have already been referred to in a general way. A diagnosis, while difficult, can be made by elimination.

5. THE LYMPHOMAS, INCLUDING THE BLOOD TUMORS AS A SUPPLEMENTARY GROUP

This group takes in the lymphomas, and, as an accessory group, the leukemias. In the opinion of many authors the analogy between leukemias and malignant neoplasms lies in the one being a tumor of the cellular elements of the blood, while the other is of the cellular elements of the fixed tissue. The leukemias, therefore, are tumors inasmuch as they present the essential features of a malignant neoplasm, *i.e.*, unlimited proliferation, atypical character of the cells, local invasion, and metastases to other organs. The infiltrative growth by leukemic cells into various organs is a well recognized phe-

nomenon. The most common leukemias in childhood are the lymphocytic and myelogenous types, and next the chloromas.

Ramsay (29) collected 100 cases of leukemias in infancy and early childhood, 91 from the literature and 9 from his own practice, in children under eight years of age. The disease was twice as frequent before the fifth year. Here, too, the larger proportion occurred in males, and in 70 per cent the lymphocytic type predominated. He found that the average duration of the lymphocytic leukemias in children was 2 months, and that of the myelocytic type 4.3 months. Clinically, the leukemias in the young are comparable to those in adults, namely, the blood picture, the enlarged spleen, accompanied by respiratory difficulty, paroxysmal cough, with general weakness, etc. The blood picture may exhibit an increase in the white blood cells anywhere from 25,000 to 200,000 or more. Roentgenograms will often disclose a mediastinal mass or metastases elsewhere.

Maciotta (30) recently reported lymphatic leukemias occurring in all five children in a family, and in the four last born of another family of eight children.

Chloroma may be included in this group. The outstanding feature is the characteristic greenish color of the tumors, which appear chiefly in the skull, vertebrae, ribs, sternum, etc. Often the first clinical sign of the disease is the bulging of the orbit, followed by the appearance of tumors over the skull. The tumors of the orbit may simulate metastases from a suprarenal sarcoma, though here the blood picture will establish a differential diagnosis. The blood reveals an increase of the lymphocytic or myelocytic elements, the lymphocytic being the more common. The metastatic tumors are usually made up of the same type of cells as those found in the blood. The lymph glands almost without exception show wide involve-

ment. The bone marrow also shows the conspicuous greenish color.

The progress of the disease is very rapid, and manifests itself usually within the first two decades of life. Ashby and Smith (31) report three cases in boys 2½, 5, and 7 years of age, respectively, all rapidly fatal, which came under their observation in a period of six months at the Middlesex Hospital in London. Rosen and Knott (32) have recently presented two cases, one in a girl of 3 and another in a girl 9 years of age.

Under another heading, as a subgroup, are lymphosarcoma and Hodgkin's disease in childhood. They are generally so well recognized that they need no further emphasis here.

GENERAL DISCUSSION

It seems to me that this subject is of sufficient interest to attract the attention of the clinician and cancer student to the relative frequency of certain well defined tumors in the young. Unfortunately the textbooks and most writers have failed to mention that of all tumors in the brain a considerable proportion occur in the first and second decades. Cushing and his co-workers emphasize that tumors of the brain are far more common than is generally supposed. Cushing states further that tumors in the brain rank in frequency with those of the breast and uterus, or at least run a very close second. Medulloblastomas are met with often enough to be spoken of by some as the "fourth ventricle tumors of childhood." Their importance can be appreciated when we keep in mind that these intracranial tumors in children make up practically 20 per cent of all brain tumors. The symptom-complex of intracranial tumors in children, in contrast to tumors in adults, expresses itself with such remarkable constancy that if one is on the lookout for these tumors, a great many can be diagnosed at the bedside. It is reprehensible, therefore, that in one

case described by Cushing, a child was seen by fourteen different consultants and one and all discounted the fact that the head had increased in size, indicating intracranial pressure. Every type of error was committed in arriving at this obvious diagnosis. To repeat again, periodic vomiting coming on in a child without gastro-intestinal symptoms, and, added to this, increasing muscular weakness, a noticeable increase in the size of the skull, and ocular disturbances should strongly point to an intracranial neoplasm. According to what has been said before, it is highly desirable that these conditions be recognized at a much earlier period of the disease, and there is no good reason why diagnostic skill here should not attain the same high level as obtains with cancer in other organs. The recent studies on radio-sensitivity, especially of the embryonal tumors, should be of particular interest. In accordance with our newer concepts that tumors in the young, made up of embryonal or lymphoid or undifferentiated cells, are highly sensitive to gamma radiation, it becomes pertinent to ask why, in this particular group of cases, the radio-active substances have received such scant attention.

Prognosis in the intracranial tumors, as elsewhere in the body, depends largely upon an early diagnosis. Operative removal of the gliomas is beset with very great technical difficulties due to their anatomic topography. In the astrocytomas, however, malignancy being less rapid, operative interference is well worth attempting, as there are cases on record which remained symptom-free for six years after the removal of the tumor. Astrocytomas are commonly cystic in children and grow rather slowly. On the other hand, post-operative comfort in cases of medulloblastoma averages only about six months.

The suprarenal tumors also speak a language of their own, and this should simplify the diagnosis in the majority of cases, espe-

cially if the pediatrician or cancer specialist is on the lookout for them.

Unfortunately most of these cases come to operation only when the dissemination of secondary tumors has involved the skeletal system, and the mortality in several of the series reported was 35 per cent from the surgical procedure, and from 70 to 80 per cent from the immediate and ultimate results following operation. On the other hand, if the diagnosis is established early, excision of the tumor has been known to result in freedom from recurrence for a number of years.

Radiotherapy has so far not played much of a rôle in the treatment of those tumors in which operation was impossible on account of extreme anemia or the involvement of large blood vessels or atrophy of the unaffected kidney, and reports are as yet too meager to justify one in forming an opinion of its value.

The effects of gamma radiation in endothelial myeloma and the giant-cell type of bone sarcoma have been pretty well recognized, and deserve a definite place in the therapy of these tumors.

In the leukemias and lymphosarcomas and Hodgkin's disease in children the radio-active substances should effect their widest usefulness, for here we are dealing especially with young and immature cells. My own experience in several cases of Hodgkin's disease and lymphosarcoma in the young convinces me that in these cases, especially, radiation has a definite field of usefulness.

In conclusion, let me point out the importance of these tumors in the young by drawing attention to the statistical studies of Pearl and Bacon (33) upon the incidence of cancer and malignant tumor in the necropsy records of the Johns Hopkins Hospital. Out of 6,670 autopsies, 816 showed some form of malignant tumor, and 6 per

cent of these neoplasms were in persons under 20 years of age.

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X-rays to be Generated at 18,000,000 Volts.
—The production of X-rays as penetrating as cosmic rays, with voltages of 18,000,000, was forecast to the American Association for the Advancement of Science when a report from Dr. F. Lange and Dr. A. Brasch, of the University of Berlin, was read by Dr. Alexander Goetz, of the California Institute of Technology.

Working in a small valley between two mountain peaks in northern Italy, a place where thunderstorms occur frequently in summer and early autumn, Dr. Lange and Dr. Brasch emulated the famous early American scientist, Benjamin Franklin, by snatching electrical energy from the skies. With their gathering system, suspended from heavily insulated wires strung across the valley, they obtained discharges of electricity which sparked 25 feet and measured 18,000,000 volts.

Assured by these experiments on Monte Generoso that Nature would provide the high

tension electrical discharges for their experiments, Dr. Lange and Dr. Brasch returned to their laboratories at the University of Berlin to construct a new type X-ray tube which would withstand such powerful discharges. They succeeded in building a tube of alternate rings of rubber and metal which has been tested at 3,000,000 volts, continuing for an interval of a millionth of a second. These 3,000,000 volt X-rays are the most powerful yet produced, exceeding any so far produced in America. Electrons are so speeded in this tube that they drill holes an inch deep in a brass plate at the bottom of the tube, each electron boring its own hole.

The new X-ray tube, made of rubber and metal instead of glass, is less than a dozen feet long, despite the high voltage it withstands. It is estimated that an ordinary X-ray tube to withstand such voltages would need to be half a mile long, and therefore could not be constructed.—*Science Service.*

RADIATION THERAPY OF CANCER¹

BASIC PRINCIPLES, THEIR APPLICATION AND RESULTS

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GAMMA rays, X-rays, ultra-violet rays, sun rays, and infra-red rays are all derived from the electromagnetic spectrum. Harder X-rays and gamma rays of radium, with which therapy of cancer is chiefly concerned, are placed at the extreme short wave end; the only shorter waves are the more recently discovered cosmic rays. Therapeutically to utilize these rays properly the radiologist must be able to produce, measure, and appreciate the qualitative and quantitative reactions of such wave length groups. To this end a brief review of the action and the more essential physical measurements should be in order.

ACTION

It is generally conceded that the biologic action is dependent on the incident radiation absorbed and the law of Bergonie and Tribondeau, that young growing cells undergoing mitosis are more susceptible to the radiation of X- or gamma rays than adult cells, has been the axiom of modern cancer therapy. Another assumption of lesser importance places the cycle of cell mitosis in human cancer tissue at three-and-a-half-day intervals.

Body tissues are arranged as follows in their order of sensitivity to X- or gamma rays: Lymphatic tissue, leukocytes, testicular and ovarian tissue, basal skin layer, mucous membranes, endothelial lining of vessels, adrenals, liver, kidney, connective tissue, muscles, cartilage, and bone. Tissue of children should be respected in accordance with their age.

Among the systemic effects of radiation may be mentioned: decrease of blood pressure, potassium, sodium chloride, cholesterol (1) and fatty acid content of the blood, while there may be increase in the alkali reserve, H^P , calcium content, plasma volume, total plasma proteins, and coagulability of the blood. While many of these facts seem fairly conclusive, still the final action on tissue is yet unknown.

DOSIMETRY

Methods of measurement of these rays may be stated to be either direct or indirect. The instruments most in use for the direct methods are the large galvanometer type ionization chamber of Duane and the small "thimble" electroscope type, of which there are several excellent varieties on the market. Instruments commonly used for indirect measurement are the common spark gap (125 mm. spheres), voltmeter, milliammeter, and an accurate timepiece.

One of the essential measurements to define ray quality is that of the kilovolt peak, probably best determined by the standard sphere gap. Such gaps (2) should be accurately set according to temperature and pressure readings by an inside micrometer. A more complicated method is by means of the spectroscope. From this function can be derived the minimum wave length by use of the following formula:

$$\frac{12.354}{K.V.(\text{Peak})}$$

The next more useful measurement is that of surface intensity. By this we mean the intensity of the radiation delivered to the surface of the body expressed generally in terms of the biologic erythema, which

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is ordinarily designated as 100 per cent. Intensity 10 cm. below the body surface compared to the surface intensity is called the depth dose. It is well known that both surface intensity and depth dose vary in accordance with changes in field size, skin target distance (S.T.D.), peak kilovoltage, and filter thickness. Both surface intensity and depth dose measurements are made by means of a suitable iontoquantimeter of the "thimble" type and a water phantom. The intensity at the surface is measured and compared as defined above with that at 10 cm. below the surface in the water phantom. Such measurements are most essential for cross-fire technic.

We must have some measurements to define the quality of the beam used in X-ray therapy. This may be expressed as half layer value, average wave length, or, as is generally done, by means of the effective wave length. Duane has defined the effective wave length as that "wave length of a monochromatic radiation that would produce the same effects (readings of the instrument employed, etc.) that the actual radiation produces." This determination is made with the same instrument used for intensity measurement and requires only the addition of a 4 mm. aluminum filter for voltages up to 130 K.V. and 1 mm. copper filter for higher voltages. In this manner is determined the percentage of transmitted radiation intensity compared to the surface intensity from which the effective wave length can be ascertained by means of a curve given by Duane (3). For deep therapy equipment at 200 K.V. and 0.5 mm. copper filter, the effective wave length is 0.16 Å., which, according to Duane, gives more information about the quality of the radiation than can be determined in any other way by a single measurement. More recently Taylor (4), of the Bureau of Standards, has elaborated on these measurements (Fig. 1).

As a result of attempts at standardization, the International Unit, the roentgen, designated as the "r unit," has been proposed

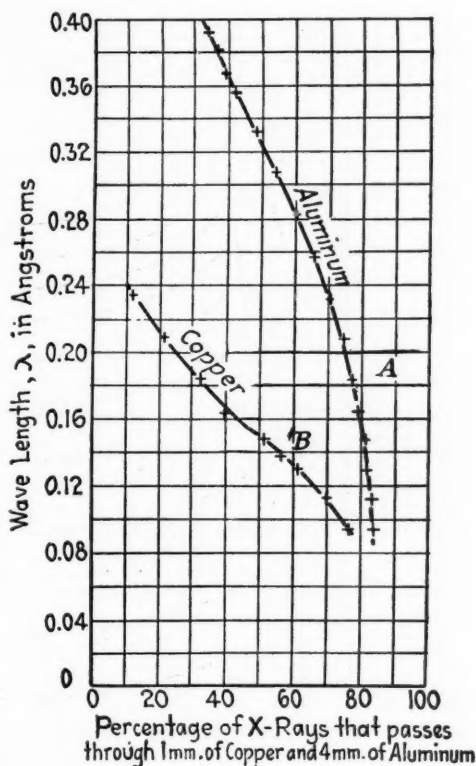


Fig. 1. Duane's curve for determining effective wave length of the X-ray. Such a curve, plus a 1 mm. supplementary copper filter in addition to the usual 0.5 mm. copper filter and a good ionization chamber, correctly used, is all that is necessary for determination of this quality defining factor of the X-ray beam (3).

and generally adopted. It is defined as "the quantity of radiation which, when the secondary electrons are fully utilized and the wall effect of the chamber is avoided, produces in 1 c.c. of atmospheric air at 0° C. and 76 cm. mercury pressure, such a degree of conductivity that one electrostatic unit of charge is measured at saturation current." The newer dosimeters, as referred to above, are conveniently calibrated in r. The Cleveland Clinic has given the following physical

dosage, expressed in r, as corresponding well with the biologic erythema, or 100 per cent dose, when secondary radiation is eliminated:

Gamma rays	1,600 r-2,000 r
200 K.V. (Cu)	800 r-1,500 r
140 K.V. (Al)	600 r
90 K.V. (unfiltered)	400 r

dose is that formulated at the Memorial Hospital under the name of "threshold erythema" (7), which represents approximately 75 per cent of the erythema in use by us. It is defined as that dose which will produce a mild reddening of the skin in 80 per cent of individuals tested, and is ap-

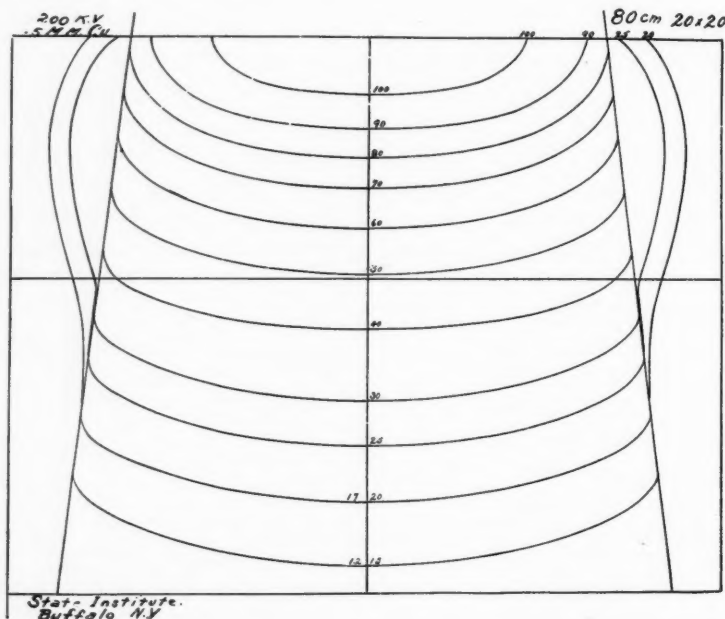


Fig. 2. Isodose chart for a field 20×20 cm. at 80 cm. skin target distance (6).

In addition to the above calibrations, which every radiologist should strive to know, there should be in every laboratory a complete set of dosage curves (5), preferably of the Dessauer type, and these should be the basis of all dosage measurement, most essentially of the cross-fire multiple field technic for both radium pack and X-ray (6), in which case bolus bags (one-third china clay and two-thirds flour by weight) should be used (Figs. 2-8).

Such physical measurement can now be cautiously checked by determining the biologic erythema by actual test on patients. Probably the best definition of an erythema

proximately 600 r. This reaction is generally most noticeable from about the tenth to the seventeenth day after treatment. The "threshold erythema" is in reality a scientific unit and is not to be mistaken as standard for routine dosage.

In actual technic with either X-ray or radium, most scrupulous care and attention must be paid to use of the proper filters to deliver the ray quality desired. In X-ray therapy 3 mm. Al, from 0.5 mm. to 3 mm. copper, and 1 mm. lead are used, but for routine work 0.5 mm. copper is probably most efficient and economical. In radium technic a filter which will screen out ap-

proximately 99 per cent of the beta rays is generally adopted. Tables giving comparative filter thicknesses for this purpose are of easy access. Thus 0.6 mm. platinum is the equivalent of 1.2 mm. lead, or 1.6 mm. brass, or 1.3 mm. silver, or 1.5 mm. monel metal, and will satisfy this requirement (8).

source of radiation, be it X-rays or gamma rays (Fig. 5).

For divided dosage technic, it is necessary to have a comprehensive idea of the principle involved. Thus the erythema produced by a single massive dose of 100 per cent at 200 K.V., 0.5 mm. copper, effective

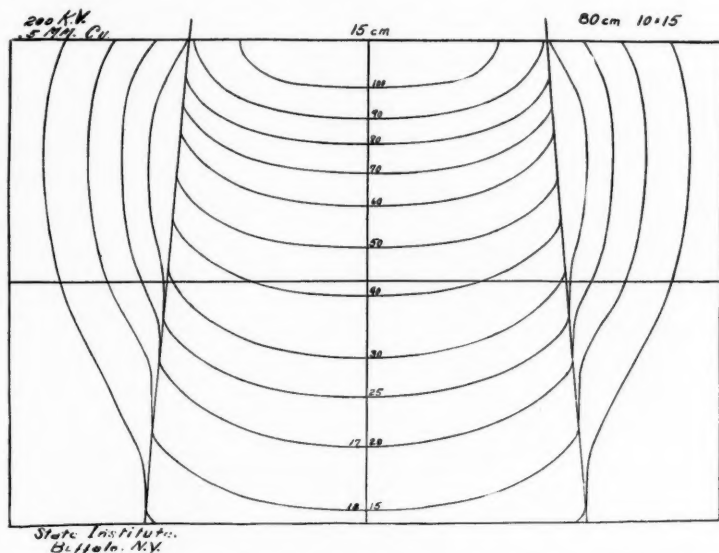


Fig. 3. Isodose chart for a field 10×15 cm. at 80 cm. skin target distance (6).

Attention should be duly given to field size and its relation to time element for the erythema dose. Thus the time factor for an erythema at a sitting for a 400 sq. cm. field will be less than for smaller fields. Failure to appreciate this commonplace law has often been accompanied by serious consequences. A curve of surface intensity in percentage of the erythema, in which the human erythema is represented as 100 per cent plotted against the field area in square centimeters, is essential and has been given by Bachem (9). In this same connection, it is hardly necessary to call the attention of radiologists to the well-known inverse square law affecting the time element in relation to the skin target distance from the

0.6 Å., has been found by us (10) to correspond to that of 110 per cent over three days, 120 per cent over five days, 130 per cent over eight days, 140 per cent over 10 days, or 150 per cent over 15 days, when treatment was given every second or third day. Pfahler (11) and Hirsch (12) had previously derived such curves and, while they show minor differences, we know from the practical experience of many thousands of treatments that ours works satisfactorily. Such curves are the basis of the "saturation" principle in technic and readily demonstrate why a dose of 100 per cent delivered over a definite time interval of days and not at one sitting, will fall short of producing the biologic erythema.

All radiologists will, therefore, appreciate the benefits of standardization of dosage and calibration of X-ray equipment, for,

the former idea, which is surely worth consideration. Nevertheless we still have treatment technic, divided roughly as follows, in

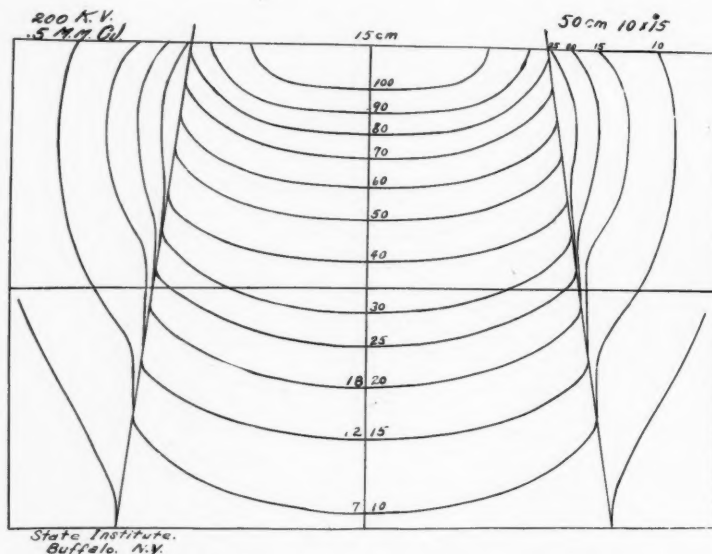


Fig. 4. Isodose chart for a field 10×15 cm. at 50 cm. skin target distance (6): 200 K.V., 0.5 mm. copper filter, 0.16 A.
Data as shown in Tables I to IV were compiled from such isodose curves and are constantly used in our work at the State Institute.

without this, the radiologist would be unable to correlate his work with that of others or to duplicate his own results. In this same sense, a close correlation of radium dosage factors expressed in erythemas or percentages thereof is equally essential. Here I will refer to previous work from the Institute (5) and a more recent paper by Quimby and Martin (13), from the Memorial Hospital. It is only by acquaintance with such erythema equivalents of various X-ray and radium combinations that treatments with these different agents can be intelligently given and danger avoided (Tables I-IV).

The question has often been asked if small amounts of radiation given over a long time are not preferable to large amounts over a short time. Regaud and Ewing have been the chief exponents of

which each type seems to have definite indications at times for both radium and X-ray:

1. Massive dose technic—unfiltered, Al or Cu.
2. Divided dose technic—Al or Cu up to 1 mm. (5).
3. Protracted dose technic—3 mm. Cu or 1 mm. Pb, low milliamperage (14).
4. Saturation dose technic—Al or Cu (11) (Fig. 6).

It is probable that, with the development of 500 K.V. and 2,000 K.V. equipment, protracted dose technic with even heavier filtration may come into vogue; or, lacking this, then the present protracted dosage technic, with 200 K.V., 5 ma., through 2 to 3 mm. Cu for from two to three hours daily, will increase in popularity. Mention should also be made of the noble experiment in

continuous general body radiation being carried on at the Memorial Hospital.

Here let me digress to call attention to

should train himself along these lines. A basic training in pathology is also most desirable, as much of the effective treatment

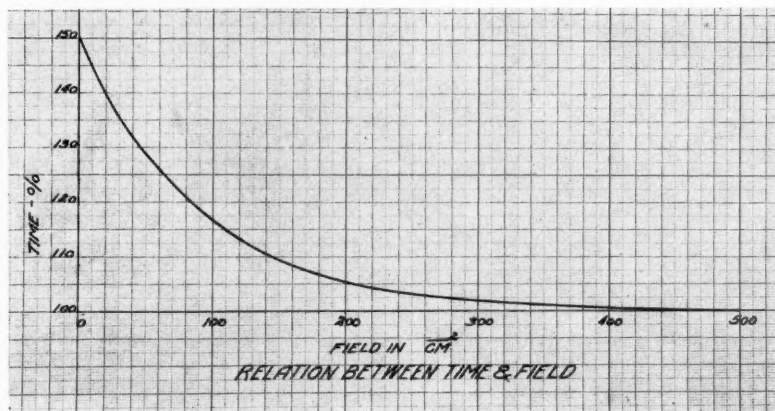


Fig. 5. If a 10×15 cm. field is used, approximately 10 per cent more time has to be given, as illustrated by the above curve, in order to get the same intensity of skin reaction as when the field size is over 400 square centimeters.

proper protection factors. The Second International Congress of Radiology (15), July, 1928, recommended a seven-hour day, a five-day week, and a month vacation yearly as the minimum for radiologic workers. All treatment rooms should have the walls covered with lead 4 mm. thick for voltages up to 200 K.V., and thicker for higher voltages. Such requirements become self-evident when we stop to reflect on the frequency of reports of ill health, and the development of aplastic anemia and lymphatic leukemia among radium and X-ray workers. Some of the earliest effects are manifested by a leukopenia and relative lymphocytosis which should not be ignored.

METHODS AND RESULTS

He who would properly treat cancer must recognize that there is no royal method of cure, that the triad on which dependence must be placed is early diagnosis, radiology, and surgery in various combinations. Thus one aiming to treat cancer proficiently

given will depend on the actual pathologic histology presented.

Time permits of but a cursory review of the methods of treating outstanding types of malignancy and the statistical results will be given as far as possible only on the basis of a five-year arrest or apparent cure of the disease, and from sources from which sufficient material has been available to make the statistics of value. Here I would call attention to the thought conveyed by Professor Regaud in his report to the Cancer Sub-committee of the League of Nations in which he referred to the fact that there is as yet no general agreement on the question of correct treatment of cancer and that only by a very thorough organization of work, resulting in the production of irreproachable statistics, can such agreement be eventually reached (16).

For accurate diagnosis I would call attention to the systematic employment of biopsy whenever permissible. This practice will also naturally increase the value of statis-

TABLE I.—TWO FIELDS OPPOSITE EACH OTHER

200 K.V.

0.5 mm. Cu

80 cm.

S.T.D.

20 × 20 cm. field

Diam. (cm.)	100 per cent on field		100 per cent on skin	
	Skin	Center	Field	Center
16	122	119	82	98.5
17	120	114	83.5	95
18	118	107	85	91
19	117	103	86	88
20	115	98	87	85
21	114	93	88	82
22	112	88	89.5	79
23	110	84	91	76.5
24	109	81	92	74
25	108	77	93	71.5
26	107	74	93.5	69
27	106	70	94.5	66
28	105	66	95.5	63
29	104	63	96	60.5
30	103	60	97	58

TABLE II.—200 K.V., 0.5 MM., CU FILTER, EFF. WAVE LENGTH 0.16 Å., 10 × 15 FIELD
80 cm. T.S.D.

Diam. (cm.)	100 per cent on field		100 per cent on skin	
	Skin	Center	Field	Center
10	133	146	75	110
11	130	139	77	107
12	127	133	79	105
13	124	125	81	101
14	122	118	82	97
15	119	113	84	95
16	117	106	85	90
17	116	100	86	86
18	114	96	88	84
19	112	90	89	80
20	111	85	90	77
21	110	80	91	73
22	109	77	92	71
23	108	73	93	68
24	107	69	94	65
25	106	65	94	61

tics. Broders' classification may be satisfactorily applied in grading the malignancy of many regional groups of cancer and is worthy of consideration from a prognostic viewpoint, especially when evaluated in conjunction with the clinical symptoms and signs.

Basal-cell epithelioma, or rodent ulcer, is one of the most common lesions. It is most often found on the face, it rarely metastasizes, and is best treated by massive doses.

Here two or three erythemas of unfiltered X-radiation, depending on the thickness of the primary lesion, or a radium plaque left in place to produce a good reaction, will succeed in permanently healing most cases, unless bone or cartilage is involved. In this event, the lesion is often very refractory. A report of 340 cases from the Institute showed primary healing in 88 per cent and permanent healing in 82 per cent of the cases (17).

TABLE III.—TWO FIELDS OPPOSITE EACH OTHER

200 K.V.

0.5 mm. Cu

50 cm.

S.T.D.

10 × 15 cm. field

Diam. (cm.)	100 per cent on field		Tonsil	100 per cent on skin		Tonsil
	Skin	Center		Field	Center	
8	135	142	144	74	105	107
9	131	133	135	76	101	103
10	127	128	130	79	101	103
11	123	119	121	81	97	98
12	121	114	116	83	95	96
13	118	105	107	85	89	91
14	116	98	101	86	84	87
15	114	92	96	88	81	84.5
16	112	87	91	89	77	81

TABLE IV.—LATERAL FACE, JAW OR NECK FIELDS

*Two fields opposite each other*200 K.V., 0.5 mm., Eff. wave length, 0.16 Å., 10 × 15 field
80 cm. S.T.D.

100 per cent on field				100 per cent S.T.D.		
Cm. diam.	Surface S.E.D.	Center dose	Dose $\frac{1}{3}$ from surface	On field	Center dose	Dose $\frac{1}{3}$ from surface
10	133	146	150	75	110	113
11	130	139	143	77	107	110
12	127	133	136	79	104	107
13	124	125	127	81	101	103
14	122	118	123	82	97	102
15	119	113	119	84	95	101

With squamous-cell epithelioma, or epidermoid carcinoma, which is more radio-resistant and tends to metastasize to the regional glands, results are less satisfactory. It occurs most commonly on the skin, lip, penis, clitoris, or vulva and the method of treatment will vary with the location and whether it is infiltrating or papillomatous. In the latter variety, unfiltered X-radiation, radium plaque or tube for 150 mc.-hrs. or more of gamma radiation, can be used on the lesion. In the infiltrating type, radon seeds of 2 mc. each in 0.3 mm. gold, or needles of radium with 0.6 mm. platinum, should be planted in the lesion, computing on the basis of 2 mc. to every 1.5 cm. of pathologic tissue. The regional lymph gland areas must be treated with heavy doses of copper-filtered X-radiation or with radium packs by the divided or pro-

tracted technic. Frequently in epithelioma of the penis or vulva this does not result in satisfactory regression. Then electrocoagulation of the primary lesion is often resorted to, with or without block dissection of the regional glands, if the capsules are intact, and seed implantation in the gland areas, followed by further external radiation. In early penis lesions, amputation by electrothermic methods and heavy external radiation may be employed. In the lesions of both the penis and vulva, the final result is liable to be palliative only. We have seven out of 60 epitheliomas of the penis from the Institute records (18) that are permanently healed for over five years, three after radical operation and radiation, two with partial operation and radiation, and two by unfiltered radiation alone. We also have alive for over six years two cases

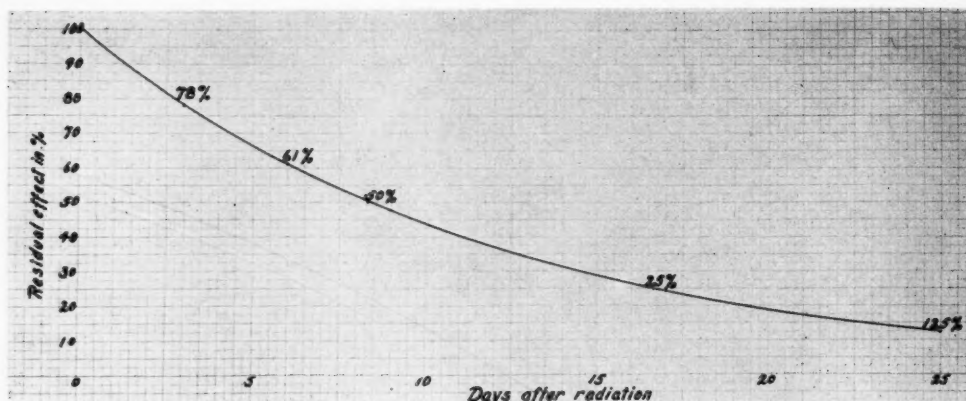


Fig. 6. Residual effect of X-rays at 200 K.V. with 0.5 mm. Cu filter, 0.16 Å. from the time of radiation over a period of 25 days (10) as observed from the skin reaction.

of epithelioma of the vulva treated by radiation.

Epitheliomas of the lip generally occur on the lower lip, metastasize readily to the regional glands, and may be papillomatous or infiltrating in type. They can be successfully treated by needling with radium needles of 0.6 mm. platinum or 0.3 mm. gold seeds, implanted on the basis of 2 mc. for each 1.5 cm. of tissue radiating around the periphery and under the lesion. Removal with the radioknife has also been advocated. Papillomatous lesions are often treated by unfiltered X-radiation, delivering two to four erythemas to the closely screened tumor, depending on the thickness of the individual lesion. Another good method consists in using a wax mold in which are incorporated radium tubes of 1 mm. platinum, the lesion being thus radiated by a cross-fire method. Regional gland-bearing areas should always be treated with copper-filtered X-radiation or radium pack in full doses. Of lesions without glandular involvement (Group I), 44, or 68 per cent, remained healed for from five to twelve years; 92 per cent of 65 cases in the same group showed primary healing according to our Institute records (19). When the glands are involved (Group II),

in 23 cases only 13 per cent were well more than five years although 61 exhibited primary healing.

Epithelioma of the tongue, floor of the mouth, alveolar process, palate, and antrum is more difficult to manage and also tends to metastasize early. Lesions of the lower jaw and floor of the mouth are prognostically less favorable than those of the upper jaw. Here, either gold seeds or platinum needles in the lesion, or a tube of gamma radiation over the primary lesion, with full dosage to the regional glands, seems generally indicated as most expedient.

Lesions of the tongue are treated, as above, with needles or seeds, and X-radiation or pack from without. Such treatments should generally produce an erythema. It is only by approaching such burning doses that therapy can produce results. Regaud has reported primary healing of tongue lesions in 75 per cent and disappearance of glands in a very small percentage of cases. Quick, at the Memorial Hospital, has reported on 140 early cases without gland involvement in which healing was secured in 85 per cent for from two months to three years. More recent experience there will show approximately 45 per cent five-year healings in cases without nodes in the neck.

Such is general radiologic experience. Pfahler has reported 55 per cent of early cases without gland involvement well for

end fatally. If they are seen early, intrinsic lesions may be operated on by doing a complete laryngectomy; otherwise attempt

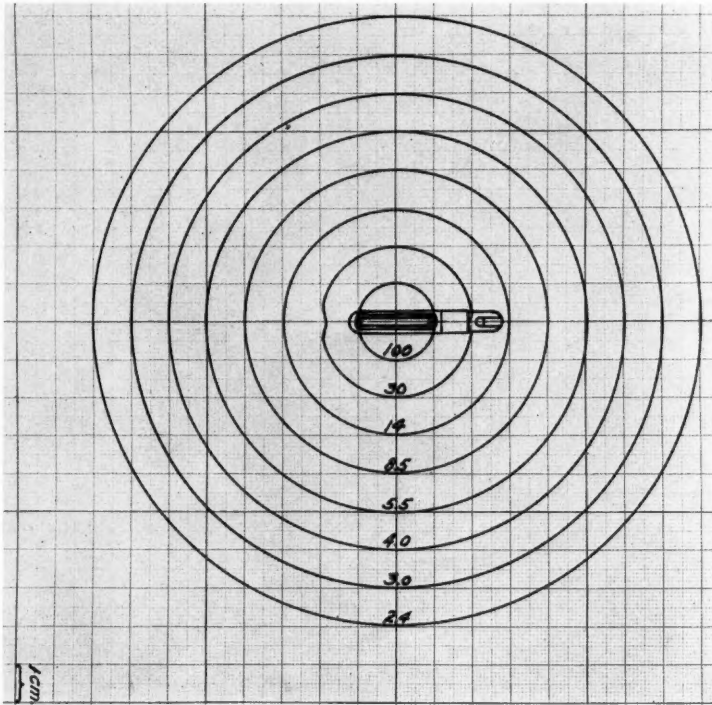


Fig. 7. Isodose curve for 100 mg. radium tube with 1 mm. Pt filtration. Active length 21.5 millimeters. From paper to be published by M. C. Reinhard and H. L. Goltz.

from one to fifteen years, and 40 per cent with glands well for from one to eight years.

Epithelioma of the pharynx and tonsils is probably best treated by seeding, as above, and external radiation to the gland-bearing areas. Quick, from the Memorial Hospital, reports 318 cases of epithelioma of the tonsil, with 14 living and well for five years. A later report, to be published by Duffy, gives 38 per cent with no gland metastasis and 20 per cent of all groups clinically cured five years or more.

While intrinsic lesions of the larynx are the more refractory, both types generally

should be made at seeding if possible from within or by splitting the thyroid cartilage and directly exposing and seeding the lesion. Any method should be followed by external radiation, or this method may be used alone. Unless preliminary tracheotomy is performed, small frequent doses making up a heavy total radiation should be given in the attempt to prevent edema of the glottis. We have two cases apparently well for several years, one by laryngectomy and the other by external radiation only. Regaud has reported very favorable results by external radiation, but no one else seems to be so successful in handling this lesion.

Cancer of the stomach or colon, if early, is generally admitted to be best treated surgically. Post-operative treatment by ex-

When copper filtered X-radiation is administered, 80 cm. S.T.D. is used to secure the best radiation dose in the tumor and glands.

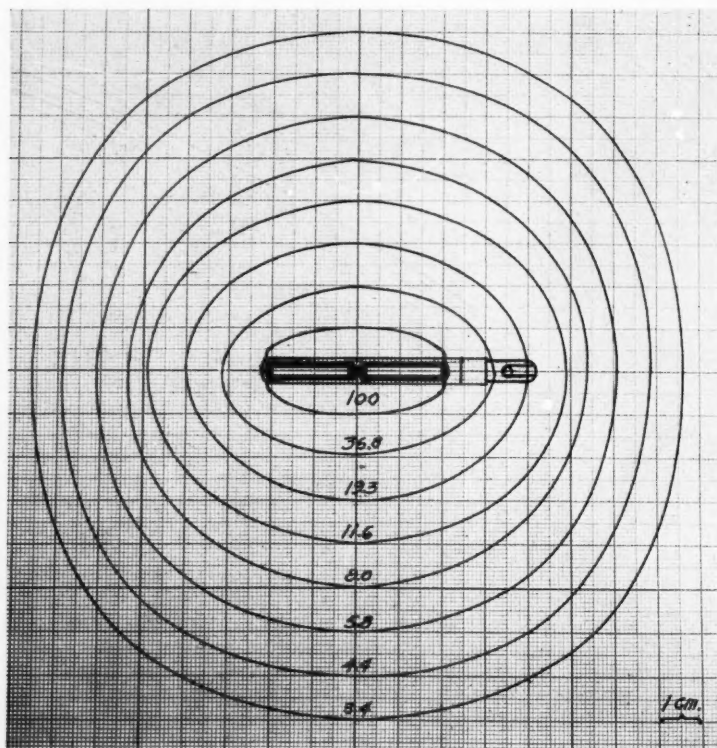


Fig. 8. Isodose curve for two tubes in tandem, containing 100 mg. radium in each tube with a filtration of 1 mm. Pt. Active length 21.5 mm. for each tube. From paper to be published by M. C. Reinhard and H. L. Goltz.

ternal distant radiation, either by X-radiation or radium pack to secure a good tumor dose, should be employed. In most cases treated up to now by exclusive radiation, the results achieved have been only palliative.

Cancer of the esophagus may be dismissed by saying that there is probably no authentic cure by radiation on record. Attempt should always be made at palliation with radium seeds or tubes placed through the esophagoscope, when this is deemed possible, supplemented by external radiation from without by the cross-fire method.

Breast cancer should be classified in the following groups, according to Steinthal:

Group I. Lesion limited to the breast and not adherent; no glandular involvement.

Group II. Same as Group I with the addition of glands in the axilla or ulceration fixed to the muscles.

Group III. Same as Group I with or without axillary involvement, but with widespread metastasis into the supraclavicular or mediastinal glands or bone.

Pre-operative and post-operative radiation is the method of choice in the operable groups but interstitial radiation according to

the method of Keynes is fast gaining popularity. Only time can tell the result.

The average length of life of untreated

including the breast, axilla, and supraclavicular region.

Evans and Leucutia (21), in reporting

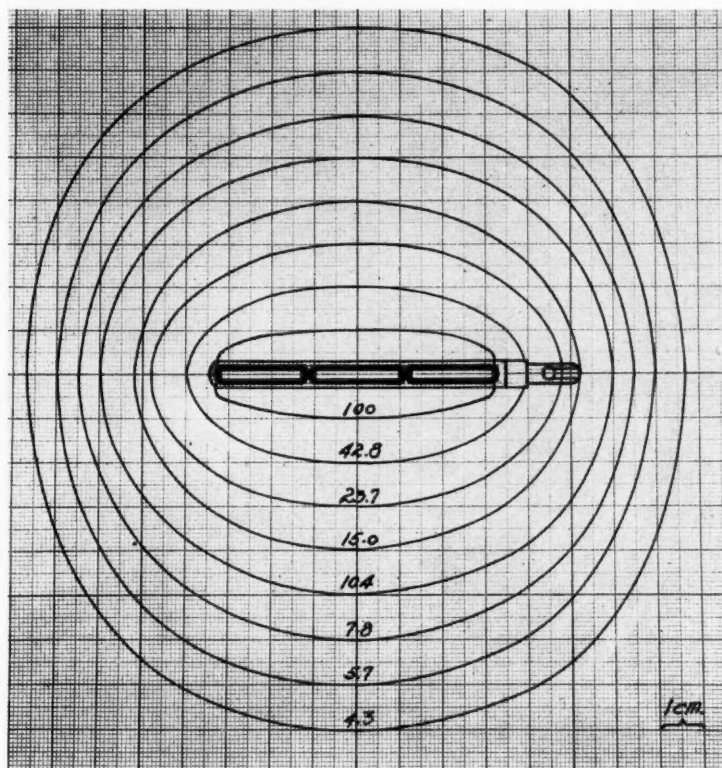


Fig. 9. Isodose curve for three tubes in tandem containing 100 mg. radium in each tube with a filtration of 1 mm. Pt. Active length 21.5 millimeters. From paper to be published by M. C. Reinhard and H. L. Goltz.

cases is approximately 32 months. Our treated cases from the Institute (20), based on a study of 489 patients, show five-year arrests as follows:

Group I	Group II	Group III
65 per cent	23 per cent	Palliation

These results were obtained in most cases by the combination of operation and radiation.

In these cases high voltage X-radiation consisted in radiation at from 40 to 50 cm. S.T.D. divided over three or four doses, giving 120 per cent over five days, 130 per cent over eight days, etc., with a large field,

175 cases, give five-year arrests as 70 per cent for Group I and 46 per cent after radical operation, and radiation to the glands in the axilla. In this latter group they believe results to be doubled by radiation. B. J. Lee, reporting from Memorial Hospital, shows five-year end-results of 56 per cent in relatively benign lesions, 30 per cent in moderately malignant, and 20 per cent in highly malignant lesions of the breast, with a total of 48 per cent in all groups treated by irradiation, with or without surgery. Schmitz, in reviewing 107 cases, reports 27

per cent for all groups (22), with 50 per cent in the operable groups, all treated with post-operative X-ray.

Rectal cancer has been conveniently classified surgically as involvement of the

gery with cancer of the rectum has nearly reached its therapeutic limit, but radium treatment of this disease is as yet very young." Later results with the gold seed-ing technic promise a material improvement.

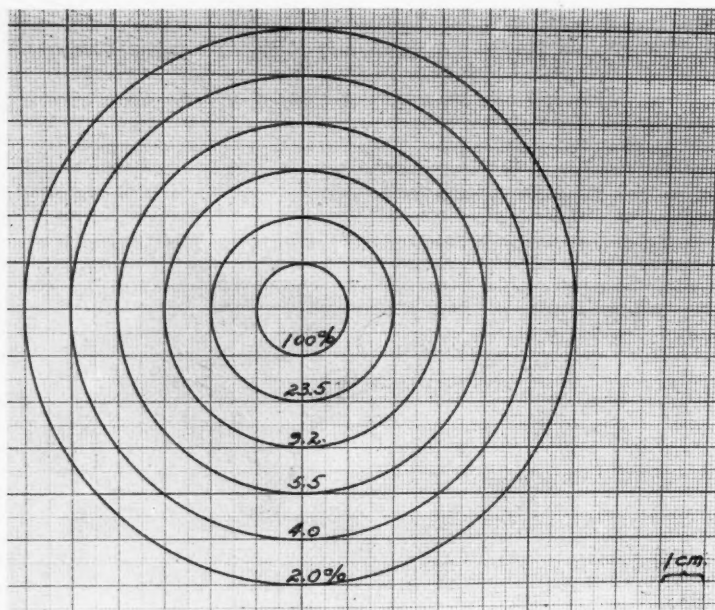


Fig. 10. Isodose curve for gold interstitial seeds of 0.3 mm. wall thickness and 3 mm. length. From paper to be published by M. C. Reinhard and H. L. Goltz.

anal canal (squamous cell), rectum, and rectosigmoid (the latter two are adenocarcinoma). Under the best radical two-stage operation, D. F. Jones has secured five-year cures in approximately 50 per cent of the cases, with an operability of 45 per cent.

Our records (23) show 17 per cent of five-year cures in the operable group. These cases were treated with radium tubes with or without glass seeds placed in the local lesion, supplemented by high voltage X-radiation over the pelvis anteriorly and posteriorly, at 80 cm. skin target distance. To quote from a recent review of 303 cases of cancer of the rectum seen at the Collis P. Huntington Memorial Hospital (24), "Sur-

Furthermore, in such a difficult operation it will always be rare to have the average surgeon achieve the skill of the masters.

Epithelioma of the bladder and adenocarcinoma of the prostate are both best handled by a combination of surgical diathermy, radium implantations, and external radiation of the pelvis by cross-fire method at a long target distance (80 cm. S.T.D.) as in rectal and uterine disease. Here the external radiation, if combined with radon seeds or needles, should only supplement the latter. The dosage in all such cases should be cautiously calculated around the bladder, uterus, or rectum on account of injury to the surrounding struc-

tures. Of course the divided dose technic should be followed. Here again results in a curative way fall short of the palliative results achieved. The relief of pain in bone metastases of prostatic, as of breast, lesions

operative mortality. For purposes of classification these lesions are best divided, according to Schmitz, in four groups.

The general method of treatment in most clinics consists in gamma radiation by tubes

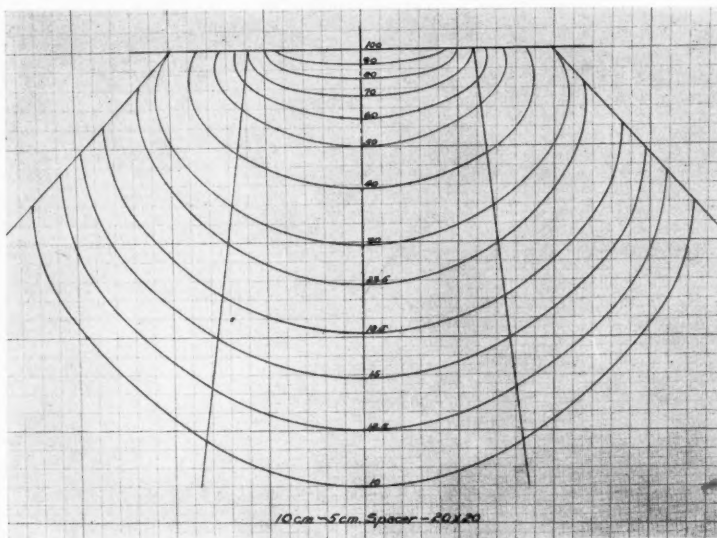


Fig. 11. Isodose curve for 4 gm. radium pack with 1 mm. Pt filtration, 3 mm. brass, R.S.D. 15 centimeters. Field size 20×20 centimeters. Depth dose at 10 cm., approximately 30 per cent. Tables for practical dosage can be made for teleradium therapy as for 200 K.V., 0.5 mm. Cu, X-ray (6). From paper to be published by M. C. Reinhard and H. L. Goltz.

is most gratifying and in some cases seems miraculous, and full doses of high voltage X-radiation to the involved bones should be used. While prostatic cancer has given only palliative results to date with radiation, the Registry of Bladder Tumors of the American Urological Association shows 14 per cent of the cases of bladder tumor alive and well five years or more. Ferguson, of the Memorial Hospital, reports 20 per cent five-year healings in bladder tumors.

Epithelioma of the cervix uteri has been one of the triumphs of radiation. Many of the largest clinics in the world to-day have discarded radical hysterectomy for this condition in favor of radiation, which produces as good results with practically no

in the cervical canal for approximately from 2,000 to 3,000 mc.-hrs. in addition to needles of platinum or seeds of gold placed around and into the cervix and adjoining broad ligament areas. This is supplemented by high voltage cross-fire X-radiation, as in the treatment of rectal and bladder lesions, calculation of combined radium and X-ray dosage being carefully made as in epithelioma of the bladder. Here again we prefer an 80 cm. S.T.D. on account of the better depth dose (49 per cent). This type of treatment and the calculations involved in the cross-fire method have been previously reported (6).

Probably the best statistical review of results achieved in cervical cancer has been

given by Ward and Farrar, of the Woman's Hospital (25). They report 53 per cent of five-year cures in operable Group I and Group II, with 25 per cent of five-year cures in all groups. They summarize similar

In a series of 48 operable cases of adenocarcinoma of the fundus uteri reported from this Institute (28), radiation has given permanent healings in 50 per cent of the cases for five years or more.

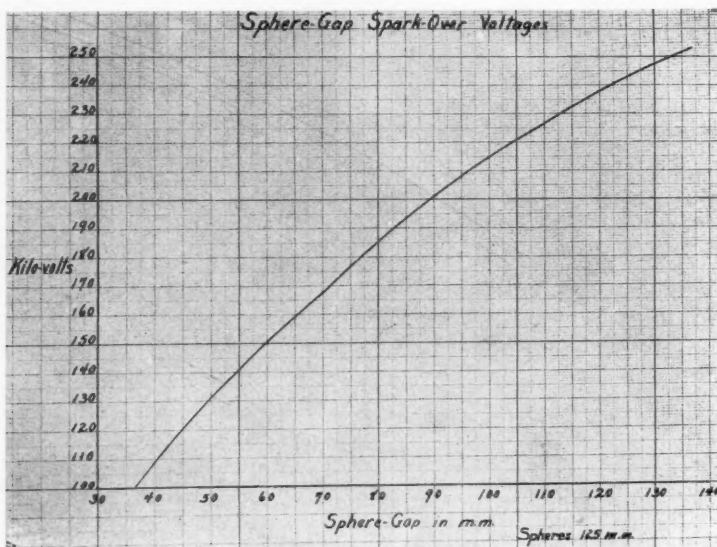


Fig. 12. The correct separation of 125 mm. spheres (both insulated) at 741 mm. barometric pressure and 25° C. temperature is 93 mm. for 200 K.V. peak.

To obtain the proper sphere gap separation for other temperature and pressure conditions, compute correction for temperature as 0.56 mm. for each degree above or below 25° C. If above 25° C., add; if below, subtract correction from 93 millimeters.

Next compute correction for every millimeter of pressure above or below 741 mm. by multiplying by 0.21 mm. for each millimeter of pressure change. If above 741, subtract; if below, add to the number obtained after correcting for temperature as above.

The result will give the proper sphere gap setting for temperature and pressure conditions desired (2).

operative results in Group I and Group II in over 3,000 cases as 43 per cent, operative mortality as 17 per cent, and operability as 43 per cent.

Our record, reviewing 374 cases (26), shows as follows:

I	II	III	IV
64.28%	28.57%	14.47%	1.44%

Group I and Group II combined totalled 40 per cent. all well five years or more. Schmitz has given equally representative statistics (27).

Round-cell carcinoma of the testis, the seminoma or teratoma testis, is practically never seen by us in the early primary or localized stage. Even after the disease has shown evidence of metastasis, the response of this tumor to radiation is spectacular. Such metastatic masses disappear temporarily and the patient feels perfectly well until later metastasis becomes more widespread and radioresistant to subsequent treatment. More recently Ferguson has reported the presence of Prolan A in the urine of such

cases and has achieved excellent results in early cases treated by removal of the primary tumor and radiation.

A recent contribution by Doub on thymoma has been of interest since we have had several such cases which have been classified as lymphosarcoma. In this type of case the response to external radiation, as reported by the aforementioned writer, is often life-saving, transforming a very unfavorable case into one of apparent health in but a few days of divided X-ray or pack therapy.

Up to now, our experience with primary carcinoma of the bronchus or lungs has been hopeless. Palliation of considerable extent has, however, been of common occurrence in metastatic lung involvement following a primary tumor in the prostate or thyroid. Here we are accustomed to use 80 cm. S.T.D. and an anterior and posterior field centered over the lesion, giving divided dosage to full skin tolerance.

Mixed tumors of the parotid are probably best treated by surgical removal of as much of the tumor as possible or by interstitial radiation, when the former seems impractical. This should be followed by external radiation either with high voltage X-ray or the radium pack in divided dosage at, preferably, a long target distance. We have previously reported on a series of 54 such cases (29) with approximately 10 five-year arrests.

Mixed embryonic tumors of the kidney, hypernephroma and adenocarcinoma of this organ, have given only palliation at the best, even after operation. Here divided dosage of high voltage X-ray or radium pack by the cross-fire method is the procedure of preference. Two cases of hypernephroma have lived two and three years, respectively, and one adenocarcinoma, which recurred after operation, remained palliated for almost two years following external radiation (30).

Let us next consider one of the most in-

teresting groups of malignant processes, namely, those known under the generic term of lymphoblastomas, including Hodgkin's disease, or lymphogranuloma malignum, lymphosarcoma, often designated as round-cell sarcoma as distinguished from the spindle-cell sarcoma, and the leukemias. This entire group is characterized by a comparatively high degree of radiosensitivity, the leukemic processes, including chloroma, being the most sensitive, lymphosarcoma the next, and Hodgkin's processes probably the least sensitive in this group (31, 32, 33).

The leukemic group of tumor processes is generally recognized by the typical blood picture which commonly accompanies these maladies. Both the chronic myelogenous and the lymphatic group respond nicely to radiation therapy, either X-ray or radium. Here we generally administer 30 to 50 per cent doses over the spleen or enlarged glands (31), the dosage being determined mostly by the blood picture. When the white blood count reaches approximately 20,000 cells per cu. mm., radiation is discontinued temporarily until a rising count indicates further treatment. Although we have been unable to cure any of these patients, or probably even to prolong their lives, I am sure we have succeeded in keeping the patients more comfortable, and often self-supporting, than could have been achieved by any other means.

There is probably no group of tumors that taxes the ingenuity of trained pathologists more than those of the lymph nodes, especially Hodgkin's and lymphosarcoma. The disconcerting fact remains that occasional sections of such tumors may be submitted to several master pathologists without securing a complete and undivided opinion as to the exact processes involved, thus testifying to the real difficulties in trying to differentiate these processes absolutely.

Here divided dosage of from 70 to 80 per cent of the skin dose delivered to the spleen or enlarged glands will generally

cause a disappearance of the process. Such patients are thus kept most comfortable but they are not cured except in a few exceptional cases of lymphosarcoma in which the disease has not spread beyond the primary seat. Thus out of 77 cases of lymphosarcoma hastily reviewed from our files, we have approximately 10 cases who have survived a five-year arrest period or better, without any manifestation of the disease. These cases were mostly those in which the disease was classified as primary or localized on admission.

While I know of no authentic cases of cure of Hodgkin's disease, it might be of interest to mention a patient treated by us who lived comfortably and worked much of the time over a period of 12 years before finally succumbing to the malady. This palliation is generally remarkable, but complete arrest of the process probably never will be secured in the present state of our knowledge.

These cases are best treated with high voltage X-radiation or radium pack, the dosage generally administered being approximately 80 per cent of the erythema (640 r), to the various groups of enlarged glands. We do not recommend the systematic treatment of all lymphatic gland areas when such glands are not enlarged unless it is impossible to see the patient for follow-up treatment at a fairly near future date.

Fibrosarcoma, or spindle-cell sarcoma, on account of its early metastasis by the blood stream, is preferably treated by radiation combined with excision, when it is primary. Here very satisfactory results have been achieved. One case, a boy with a primary spindle-cell sarcoma, was well following radiation from 1917 to 1926; then he developed a recurrence which was surgically removed, followed by radiation of the scar. He has remained well to now with no recurrences. A cursory survey of these cases from the Institute records shows arrests of five years or over in approximately 10 cases

out of 52 in which the lesion remained clinically healed (30).

Bone sarcomas furnish a most interesting and, at the same time, a pessimistic group for treatment. Roentgenograms in this group of tumors are often of more diagnostic significance than poorly chosen or insufficient biopsy material. Bloodgood thinks it is safer to radiate such tumors than to make a biopsy, if there is doubt of the pathologic diagnosis (34). The needle puncture method of securing a biopsy specimen, as recommended by Martin and Ellis, is often successful in distinguishing malignancy from benignity (35). Bloodgood recommends resection if possible for a lesion of the upper extremity, or when the growth is below the lower third of the femur; otherwise he advises a continuance of the radiation treatment. For such a lesion, long skin target distance to full skin tolerance by the divided or protracted technic is the method of choice. We have never produced more than palliation in the osteogenic sarcomas, whereas, in the Ewing sarcoma, palliation both objectively and subjectively is most marked and can be secured by lesser dosage due to the unusual radiosensitivity of this tumor. In fact, the greater radiosensitivity of the Ewing tumor serves to differentiate this endothelial group of bone tumors from the true sarcoma processes. Coley (36) has secured some remarkable results with combinations of surgery, radiation, and the use of Coley's toxin in this group.

We cannot pass without a few brief remarks on the so-called giant-cell sarcomas of bone which Bloodgood has shown to be generally of a benign nature. We have had occasion to treat by radiation many such giant-cell tumors of bone, including the solitary bone cyst, with generally a most gratifying response and lasting result, corroborating the experience of the Memorial Hospital in New York. Here the lesion should be thoroughly radiated with full skin

doses by a divided technic. In approximately 10 cases so treated, we have succeeded in bringing about a diminution in the size of the tumor, restoration of function, and often the appearance of calcification in the lesion, as demonstrated by the roentgenogram.

Melanosarcoma, or melanoma, has always been classed as a most malignant process. Our records show a five-year arrest and clinical cure in 8 out of 16 cases in which the malady was seen early, before metastasis had occurred (30). In those with dissemination of the process, palliation is all that can be expected at the best. Here radiation therapy, either pack or roentgen rays to full skin tolerance, can be given with small field and closely screened lesion by massive dose technic. The metastatic or gland-bearing areas are best treated by divided dosage methods.

As to the question of repeating the treatment, I would say that it is the consensus of opinion to treat cases with a heavy dose, repeating as seldom as absolutely necessary and not within two or three months in the average case. Too frequent repetition may lead to late tissue reaction three or more months following the last exposure. This is becoming more evident as an example of our enthusiasm to cure, especially as many of the cases of cancer are now living longer than before the advent of radiation. Reports of squamous-cell epithelioma occurring in the scar of a healed breast cancer as the result of X-radiation have come to the writer's attention. The greatest caution is necessary in radiation treatment in general and we should always remember that radiation is not an absolute specific nor does it always cure cancer.

In closing I will quote Dr. Burton T. Simpson (37): "Up to the present time, we have been working with radiation in a purely empiric way, obtaining results without a definite knowledge of its mode of

action. Should it transpire that this agent has a specific action on the cancer cell, the outlook for future results, by using this method of treatment, is very bright."

EXPLANATIONS

Tables I and IV are based on isodose curves (Figs. 2-4) measured at 200 K.V. with 5 mm. copper filter and 0.16 Å. effective wave length, and are suitable only under the above conditions.

To use the same, the diameter of the part to be treated is first determined. If two opposite fields are then applied at the extremes of the diameter, the resulting dosage can be calculated from the tables by using the figures given opposite the corresponding diameter of the part. (See References 5 and 6.) This method, besides possessing equal accuracy, saves time and the more cumbersome application of the isodose curves.

To translate radon dosage into approximate percentage of X-ray erythema at a distance 3 cm. from the center of the tubes or a seeded area, *i.e.*, as in the application of uterine tubes or seeds. Tubes (100 gm. radium or emanation) to have 1 mm. Pt filtration, or its equivalent. Seeds to be made of gold tubing with 3 mm. wall thickness and to be approximately 3 mm. long.

For intracavitary tubes (one, two, or three in tandem) or gold seeds with filtration as above when the seeds are distributed within the inner half of the radius of the lesion (Quimby and Martin), multiply the total millicurie-hours by the factor 0.03 and the result will be the approximate percentage of the X-ray erythema 3 cm. from the center. These calculations are based on isodose curves. (See Figures 7 to 10.)

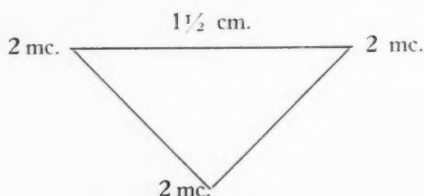
APPROXIMATE DOSAGE FOR TELERADIUM PACKS

(1 mm. platinum and 1 mm. aluminum)		
6 cm.	S.T.D.	16,000 to 20,000 mg.-hrs.
10 cm.	S.T.D.	30,000 to 35,000 mg.-hrs.
15 cm.	S.T.D.	60,000 to 70,000 mg.-hrs.
divided into daily doses		

1 gm. of radium liberates in 1 hour 7.51 mc. emanation or radium destroyed.

1 mc. radon gives the equivalent of 133.3 mc.-hrs. of radio-activity before it is completely decayed in its cycle of approximately 30 days.

BASIS OF SEED IMPLANTATION, 0.3 MM. GOLD



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New Blood Test for Cancer Developed by German.—A new method of detecting cancer in its early stages has been developed by Dr. Hans Jacques Fuchs, member of the physiological institute of the Veterinary University of Berlin. Details will be published in a German scientific journal. So far, 2,000 cases have been successfully diagnosed by the new method, the diagnosis being confirmed by operation or dissection. The method also makes possible the determination of the presence or absence of cancer when an infectious disease occurs at the same time. Further, it is claimed that by this method the success of surgical or radiologic treatment of cancer can be controlled.

The new method depends on the digestion of serum from the blood of a suspected cancer patient with fibrin prepared from the blood of a normal person and with fibrin from the blood of a person known to have cancer. The digestion goes on for ten hours at a temperature of 104° Fahrenheit. The protein

is then removed from these samples and the amount of non-protein nitrogen present in each is determined. Depending on the amount of non-protein nitrogen present, it is possible to make a diagnosis as to whether or not the suspected case is one of cancer.

The new method is the result of five years of incessant research work during the course of which Dr. Fuchs had to make a number of pieces of special apparatus in order to achieve the necessary exactness in his determinations. The method also marks the first time that a chemical determination of a serological process has been made.

A certain diagnostic test for cancer, such as this is hoped to be, will be particularly valuable because modern methods of treatment by surgery and radiation are chiefly successful only in the early stages of the disease. When cancer attacks the internal organs, it is nearly impossible to detect it in its early stages by present methods of diagnosis.—*Science Service.*

SEVEN THOUSAND ÅNGSTRÖM UNITS PLUS¹

By RALPH C. WALKER, M.D., PORTLAND, OREGON

BACK in the dim and distant past when man first made his appearance on this globe, he had no need for heat to keep himself warm and comfortable, for the earth was steaming and covered with a rank vegetation. Man had not yet learned to cook his food, for he had had no acquaintanceship with fire, and so still lived on herbs and shell fish. Terrific storms raged over the face of the earth, and the electrical discharges from the moisture-laden clouds brought terror to his primitive heart, but no fires resulted from this fascinating display, owing to the great dampness of the vegetation.

Later this condition gradually changed and man was made acquainted with the phenomenon of fire, which he worshipped, for he had grown to believe that it had been created by the gods of lightning, whose language he had partly understood in the terrible bolts. As the temperature of the atmosphere gradually decreased, man timidly approached these sacred fires and discovered that the heat was comforting to his benumbed body. Still later in the process of evolution, we are told that at one time two wild animals engaged in a death struggle accidentally fell into one of these fires and that their bodies were partly consumed. The odor of roasted flesh stirred a something in the innermost part of the cave man, and approaching, he timidly poked with his finger at the half-burned body of one of the animals. His curiosity cost him a burn and he promptly stuck the injured member into his mouth. The results were surprising, for, in addition to having cooled his finger, there lingered a delicious taste. Being more cautious next time, he procured a stick and

continued to experiment, with gratifying gastronomic reactions.

An important moment in history was recorded, for the status of the cave man immediately changed from that of the hunted to that of the hunter. The beasts were pursued and their bodies consigned to the sacred fires until they were roasted, after which they were devoured. In tending these fires men found that their bodies were not only warmed, but that their bruises and contusions were greatly benefited. Thus from antiquity comes our first lesson in the use of "seven thousand Ångström units plus."

The technic of conveying this modality to the body varies considerably. Primitive man probably first stood before the fire or slept in the warm ashes or on the heated ground. Later, we read, the early races placed heated stones in a pit dug in the ground, and, by pouring water on them, caused steam to be generated which was confined by means of coverings draped about the body—a forerunner of our modern steam baths.

Personally I can remember that as a child I was awakened at night by the so-called growing pains, at which time my mother would take me on her lap and, opening the door of the big "base burner," would hold me before the glowing coals thus to administer the infra-red rays to my aching limbs, with soothing results. Many of you will recall the warming pans, the jug filled with hot water, the heated flat-iron wrapped with flannel, and other contrivances for producing therapeutic heat.

With the development of high frequency currents and their adaptation for use, we thought that we had an ideal and convenient method of heating at will any portion of the body. Naturally, it should be a wonderful thing for pelvic conditions in both male and

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female, but, after several years of trial, we have emerged more or less disappointed with the results.

Let us consider for a moment why this modality has not been all that we had hoped for in the treatment of different forms of pelvic pathology—first, as to the generator itself. Many types were put on the market, some good and many bad, the main trouble being a lack of capacity. Second, the electrodes were improperly constructed, the usual trouble being a lack of surface, especially in the active electrode. Third, improper measurements of the heat supposed to be produced in the tissues—in reality, in the electrode only. Fourth, a wrong conception of what was actually needed as to type of heat and its application for the cure of different pathologic lesions.

Take, for example, gonorrheal conditions. Different authors claim that 114 degrees Fahrenheit are necessary to kill this type of bacteria. The answer to this is contained in the report of Scheffey and Schmidt (1), from the Departments of Gynecology and Physical Therapy in Jefferson Medical College, in which they say: "Whatever diathermy accomplishes is due to the increase in circulation brought about by local application of heat, rather than from any heat generated in the diseased tissues themselves, and surely not from any destruction of bacteria by heat." Also this quotation from an article by Jeck (2): "After all, it is the heat, however applied, that turns the trick."

The first really scientific attempt to arrive at the temperature of the female pelvis has been carried out by Dr. Royston and his co-workers (3). They have designed an interesting instrument and measured the temperature in a very satisfactory manner, and their work is to be highly commended. Nevertheless, let me quote from Paragraph 8 in their conclusions: "It is impossible to maintain this degree of heat (108 to 115 degrees) for a period of over five to eight minutes, due to the dissipation of heat by

the blood stream." This is not due to faulty technic, but to the modality used, namely, diathermy.

What is needed by the average practitioner is a simple, safe, and efficient method that requires no electrical knowledge nor special, complicated technic, and which is applicable to both male and female pelvises.

Feeling that much could be gained by exploring the field of heat generated from ordinary sources, and realizing the benefit that we have derived from hot water in the form of baths, douches, irrigations, the hot water bag, etc., the writer decided to investigate from this angle.

Hot water applied directly to the mucous surfaces is, after a time, an irritant. It is also "messy," yet it produces an ideal, even heat. Water confined within a suitable container that is flexible yet separates it from contact with the mucous membrane should be ideal. The container must be flexible and dilatable, so that it will conform to any and all irregularities of contour. The arrangement must be such that when its bulk is introduced into the vagina or rectum it will be small, yet capable of being increased so that a maximum amount of heating surface may be brought in contact with the pelvic contents. Therefore, a perfectly safe heating element must be designed, one which a novice may operate and one which cannot produce a steam burn in the event that the flexible container should break or leak.

The diathermy electrodes on the market to-day are all of the rigid variety, and the surface contact is necessarily limited, the greatest amount of electrical contact obtainable being from approximately 10 to 12 square inches. Due to the rigidity of the instrument, perfect contact with a prostate, for example, is impossible, while a flexible instrument will mold itself around the organ, thereby bringing the maximum amount of heat in contact with it.

The problem of maintaining heat in the

pelvis may be compared to that which the heating engineer has had to meet in a draughty house. We wish to produce temperatures greater than the blood; therefore, our blood stream is acting as a cooling system. The engineer increases the number of square feet of heating surface in his radiators until the required amount of heat is obtained in the house. We must increase the number of square inches in our heating system if we are to obtain a required temperature in the pelvis and to maintain it there. Let me again call your attention to the statement of Dr. Royston and his co-workers to the effect that it was impossible to maintain the high degree of temperature for more than from five to eight minutes, due to the dissipation of heat by the blood stream. If we are to get results from heat, we must be able to keep the temperature steady for such length of time as we find necessary for the pathologic condition under treatment.

After much experimentation the speaker has designed an instrument which meets the requirements. The number of square inches of heating surface is approximately 40 for the average patient. The heater is so constructed that it cannot possibly injure the patient. The temperature of the tissues in the pelvis can be raised to 114 degrees Fahrenheit and kept there indefinitely if desired. It has been found that from 30 minutes to one hour is as long a treatment as is usually necessary. Treatments are repeated daily until a marked improvement is noted, after which tri-weekly applications are sufficient.

During the last few months, experiments have been carried on with another type of instrument having the same fundamental principles but designed to be used externally. This has many advantages, the principal one being that it pre-heats the blood stream so that a higher temperature may be maintained within the pelvis with more comfort to the patient. Experimentally it has been

found possible to raise the temperature from four to ten degrees without the patient being cognizant of the fact.

Massage has long been recognized as one of the outstanding physical assets, whether applied by the human hand, by water as in the shower bath, or by mechanical vibration. Heat and massage have always been linked together; therefore, it was but natural to add this modality to the heater. Needless to say the results have been surprisingly improved, so much so that the heating instrument alone is now seldom used except in the very acute cases. Both the internal and external instruments are fitted with these special forms of vibrators. I say special forms because one cannot use the vigorous type of vibration that is produced by the average vibrator sold.

These vibrators must be very gentle in their action so that sexual excitation may be avoided. Yet, with this mild form of vibration, infected tubes in the female and prostates in the male are induced to drain their contents with surprising ease. I have not found it necessary to carry on the usual prostatic massage so universally used. All authors have warned us of the dangers lurking in too frequent, or vigorous, prostatic massage. Would it not then be well to eliminate this phase of treatment and thereby, perhaps, remove one cause of malignant degeneration? With this instrument, which molds itself to the contour of the prostate and produces a mild pressure thereon, the heat and vibration produce drainage without irritation or bruising.

The inroads made by gonorrheal infection in the pelves of both male and female have, for many years, held the attention of the medical profession and the public in general. Anything that will assist in combating this disease will have a definite place in our armamentarium.

About two and one-half years ago the Seattle City Hospital used a bag of rubber which was inserted into the female pelvis.

The bag was provided with an outlet and shut-off clamp, and hot water was introduced through a rubber tube from an ordinary irrigator, the height of the irrigator determining the amount of dilatation of the rubber bag. The heat was gradually increased by allowing the water to flow for a few moments out of the bag into a refuse pail, the temperature of the water in the irrigator being gradually increased to increase the heat in the bag. The time of treatment was 1.25 hour. Even with this crude instrument the results were very surprising.

I have a photostatic copy of one of their reports on the treatment of these acute and chronic gonorrheal cases. The list comprises 35 cases, ages from six to 42 years, the average age being 24 years. Of these, 10 were fresh cases. These chronic cases had failed to respond to the usual treatment. The average number of treatments received under the new method was 10; the greatest number of treatments given was 30. By the old method, the greatest number of treatments given was 77, with an average of 28. To quote the report, which is dated Jan. 3, 1928, the requirements for discharge are as follows: "No person shall be released from quarantine on account of gonococcus infection until three sets of smears of the urethra and cervix, two single and one double, a total of eight—48 hours elapsing between each set, with no douches or treatment—be taken and submitted to an approved laboratory with the report of ALL smears being free from gonococci."

The report does not state the condition of the pelvic organs, which, to those of us handling private cases, is of the utmost importance. In our practice, the cases reporting for treatment are usually of the chronic type with tubal or prostatic infection. Our custom has been to discharge the patients when they are free from all of their pathology, rather than just the gonococcus as

demonstrated by the slide test. Also, not all of our cases are venereal. I can perhaps best illustrate by giving you several histories, in synopsis form.

CASE REPORTS

E. F. X., female, age 49 years, had previously undergone a subtotal hysterectomy for prolapse, part of one ovary being left. The appendix had been removed and the gall bladder explored and found to be full of calculi; however, it was not removed.

The patient was constipated and had been using laxatives for 15 years. She had a rectocele which she held in place by inserting her fingers into the vagina when her bowels moved. The woman suffered from severe headaches every two weeks which confined her to her bed for two or three days at a time. She had experienced hot flashes for two years preceding the present examination. She was mentally depressed and threatened to commit suicide.

This, my first case, was treated with what I now consider a very crude instrument which produced heat only. Treatments were given tri-weekly from May 29, 1929, to August 22 of that year, when she went to the beach. On her return, the patient was treated irregularly until December 20, receiving a total of 74 applications. After three treatments, the woman reported improvement and no headaches. A slight one occurred about a week later, and a little vertigo two weeks later, which was relieved by her lying down for an hour. On September 6, the patient reported that she had had no headaches, and her bowels were moving naturally twice daily. The rectocele at this time remained in place unless very heavy lifting was done, the hot flashes had disappeared and the mental depression was dissipated. In October, she did house cleaning, reporting for a few treatments then, and again in December, when nine treatments were given for the same trouble. The pa-

tient has had no treatments since December, 1929, and, upon a recent examination, I found her entirely well. She reports that the rectocele is staying in place and that her bowel movements are normal.

E. H. Y., female, age 30 years, exhibited an old chronic gonorrheal infection, involving both tubes. On March 1, 1929, the woman suffered an acute attack and was taken to the hospital. Inasmuch as she was flowing, the attending physician thought that attempted abortion was the cause, and so curetted the uterus. As her temperature rose to 105.5 degrees a blood transfusion was given, as well as numerous saline injections. The patient left the hospital after 10 weeks and spent eight weeks at home, where, although she gained in both weight and strength, the pain was acute in her tubes whenever she stood.

At this time, her surgeon wished to remove the tubes but she refused. She was placed on our treatment July 29, 1929. After the first one, she had a bloody, purulent discharge but her improvement was marked, and she resumed her work which kept her on her feet eight hours daily. In October her surgeon pronounced her well. At this time the tubes could not be palpated and there was no soreness in the pelvis.

H. H. B., male, age 32 years, had suffered from a gonorrheal infection four years previous to the present examination. This yielded to treatment after a tempestuous course and there had been no return of symptoms. The patient, who consulted me on account of inability to perform his family duties, said that he had been drinking quite a bit of homemade beer. Examination showed the prostate to be slightly enlarged and tender, but smears made from fluid expressed from the posterior urethra showed non-specific bacteria. After the second treatment, the patient had a discharge, purulent in character, but negative for gonococci. After the tenth treatment the discharge dis-

appeared and he was able to have intercourse successfully. He was discharged after 34 treatments.

A. N. Z., male, age 62 years, height 5 feet, 7 inches; weight 200 pounds, stripped. There was no venereal history. Hypospadias; about four years previous to the present examination, the patient found it necessary to urinate more frequently at night, attributing it to an irritable bladder due to his drinking great quantities of water. The number of urinations gradually increased to seven or eight a night. Two years previous to examination, the patient had had an acute prostatitis, but was catheterized only twice. At the time the residual urine was about seven ounces and he was told that operation was necessary. This was refused. On Oct. 14, 1930, the patient suffered another attack and consulted me. I removed 36 ounces of urine from the bladder, administered urinary antiseptic, and catheterized him four times daily. Examination revealed a very large, smooth, hard, and tender prostate. Pelvic treatment was instituted at once. Within a few days the patient began to void a bit of urine. The amount rapidly increased, and the catheterizations were decreased in number as the residual urine lessened. It is very probable that the patient had had residual urine during the four years preceding. Six weeks later, the prostate had decreased very materially in size and was not tender, and the residual urine amounted to between 1.75 and 2 ounces.

The patient was not confined to his bed nor was it necessary to irrigate his bladder. Since beginning the treatment, he has continued to attend to his professional duties, has gained in strength, and now reports that he feels better than he has for several years. What the final outcome will be I cannot at this time say, but most certainly, if there be need for surgical interference, the patient will be found in a much improved physical

condition and so better able to meet the shock of an operation.

SUMMARY

1. The use of seven thousand Ångström units plus dates back to antiquity, fires started by lightning flashes probably being the first generators to be put to use by mankind.

2. The development of high frequency currents marked the modern use of this modality, but results in pelvic pathology have not been all that we had expected.

3. Failure has been due to the lack of proper equipment, improper measurements of the heat produced, and a wrong conception of what was actually needed in the type of heat and its application for the cure of different pelvic lesions.

4. The development of a dilatable instrument to increase the heating surface in the pelvis and to maintain constant temperature up to 114 degrees Fahrenheit over long periods of time, without danger to the patient, has been a most important step.

5. The average physician needs a simple, safe, and efficient apparatus, one which re-

quires no electrical knowledge or mastery of complicated technic, and which may be used to treat both male and female pelvis.

6. The proper type of vibration, in addition to heat, secured results in a much shorter time than did the thermal instrument alone.

7. The development of an external applicator to pre-heat the blood stream enables one to secure higher temperatures more rapidly and without discomfort to the patient.

8. The results after three years of experience show that both acute and chronic pelvic inflammatory processes can be made to yield in a much shorter time than by the usual mode of treatment, and, in many cases, surgical interference is unnecessary.

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X-rays Relieve Baby's Stomach Obstruction.—The method whereby X-ray treatment relieves obstruction of the lower opening of the stomach in newborn infants has been successfully used in 33 cases during the last five years, in only four of which it was unsuccessful.

Special diets, drugs, and surgical operation to remove the obstruction have all been found effective

methods of relieving pyloric stenosis in many cases. The advantage of the new method which employs X-rays is the saving of time. The radiation takes effect within 24 hours if it is effective at all, whereas if medical treatment is tried it may require a week or two to be effective. By that time, if it is not effective, the child may be so weakened that he cannot stand an operation, if one is considered necessary.—*Science Service.*

A CRITIQUE OF THE ROENTGEN SIGNS OF INFANTILE SCURVY

WITH REPORT OF THIRTEEN CASES

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A STUDY of infantile scurvy at present appears to have lost much of its former interest; first, because its etiology is now firmly established, and, second, because of the fact that the disease is rapidly becoming an almost extinct disorder in civilized countries. Nevertheless, the condition still exists. It is interesting to note that the cases which are presented here occurred in Southern California where "sun-kissed oranges" and other citrus fruits which contain the antiscorbutic vitamin are so abundantly produced.

The literature on infantile scurvy is now so enormous that an attempt to review it would be too tedious. But it is important to remember that the disease was first thought to occur frequently in combination with rickets (10), and was, in fact, thought to be a form of acute rickets (20). It was Barlow (4), however, who gave the first comprehensive account of the disease as an independent clinical entity, basing his observations on 31 cases of infantile scurvy. In 1898 a collective investigation of the disease was undertaken by the American Pediatric Society (2). A very extensive study of the anatomy and pathology of scurvy was made by Höjer (17), who characterized the condition as a disease of actively functioning cells throughout the body. Hess and his associates (14, 15, 16) have published numerous papers on the modern conception of the disease in its various aspects.

As the skeletal system exhibits the most characteristic changes in this disease, valuable contributions have been made chiefly in the field of roentgenologic diagnosis. The earliest work was done by Fraenkel

(9), who described (1906) the zone of hypercalcification at the ends of long bones and called it the "white line." Wimberger (29, 30) called our attention to the circular shadow surrounding the center of ossification in the epiphysis of the long bones, insisting on its specificity in scurvy. He considers this a valuable sign in differentiating scurvy from rickets. Schwartz (26) made an interesting observation of the persistence of this ring inclosing the previously rarefied epiphyseal body as a pale inset in the later epiphyseal structure. This shows a much denser shadow as a result of healing. "The coarse, dense structure of the later bony growth appears in such contrast to the washed-out appearance of the previous epiphysis that the epiphyseal structure appears to have a double contour." He also found the same insets at the carpus and tarsus. Of course, these were only in the epiphyses that had reached ossification, namely, the os capitatum and the os hamatum in the carpus, and the os calcis, the astragalus, and the cuboid in the tarsus.

Pelkan (22), basing his observations on the roentgenograms in human scurvy as well as in experimental scurvy of guinea pigs, emphasized, in the diagnosis of early scurvy, the importance of the ground-glass appearance of the shaft, due to the disappearance of trabeculae. He proposed the term "scurvy line" to take the place of the term "Trümmerfeld zone."

The four stages of infantile scurvy were clearly set forth by Bromer (6), who analyzed 56 cases from the standpoint of roentgenologic diagnosis:

1. The latent, or borderline, stage, in which the most constant sign is the smooth,

transparent, ground-glass appearance of the shaft, the pencil-point thinning of the cortex, and the edging of the epiphyseal center.

2. The second stage is characterized by the appearance of the zone of decreased density just behind the dense broadened line or zone of temporary calcification at the end of the diaphyseal shadow. Furthermore, the first sign of hemorrhage may appear, indicating the weakening of the zone of temporary calcification, some of its substance being pushed out by the slight trauma of the distending force of the hemorrhage.

3. The third stage is that of well-developed subperiosteal hemorrhage. It is in this stage that epiphyseal separations most frequently occur.

4. This is the stage of absorption of hemorrhages with repair of all of the scorbutic lesions. The progressive decrease in the breadth and length of the hemorrhages, with evidences of calcification, can be made out at this stage.

The most recent contribution along this line was made by McLean and McIntosh (19), who made a valuable *résumé* of the frequency with which the various roentgenologic signs of scurvy occurred in 51 cases, with especial emphasis on the process of healing. They described multiple epiphyseal separations at vertebral ends of several ribs in one patient, which three weeks afterwards were seen to be undergoing calcification with elevation of the periosteum. Although the beading of the costochondral junctions on the anterior chest wall in scurvy had been described adequately by Hess and others, this phenomenon of epiphyseal separation at the vertebral ends of the ribs was, for the first time, described by McLean and McIntosh.

The 13 cases which form the basis of the present observations were all seen in the medical wards of the Children's Hospital, Los Angeles. These cases are presented, not as revealing any new facts about infantile



Fig. 1. Lateral view of the right leg, Case E. P., 11 months old, taken Nov. 16, 1927.

tile scurvy, but as furnishing the bases on which a critical evaluation of the roentgen signs may be made. The essential features of the cases are summarized in Table I.

From the summary thus tabulated of the main clinical findings in these cases, it is clear that there is a definite relation of feeding to the development of the disease. Practically all are artificially fed infants, either pasteurized cow's milk or some proprietary milk or sugar preparations having been used. Condensed milk, Mellin's food, malted milk, and even S. M. A. have been mentioned in the feeding history of these patients. Orange juice was not given consistently except in one case in which, however, the dose, one teaspoonful daily, was very inadequate. Often mothers state that their scorbutic infants do not take the orange juice well, which apparently constitutes a sufficient excuse for not insisting on

TABLE I.—SUMMARY OF THIRTEEN CASES OF INFANTILE SCURVY

Name	Age, sex	Feeding history	Symptoms and signs	Hospital diagnosis
J. O. P.	1 year, male	Breast feed first few days; then S. M. A. until 7 months. Orange juice not well taken.	Pain and swelling of lower extremities; loss in weight; pallor; bulging of right eye; petechial hemorrhage.	Scurvy, rickets, secondary anemia
X. H.	14 months, male	Pasteurized cow's milk; no sugar; no orange juice.	Sore mouth and swollen gums; lost three or four teeth. Cries when moved.	Scurvy, rickets
D. W.	10 months, female	Eagle Brand milk for one month; then formula with orange and prune juice (1 teaspoonful) once a day.	Swollen ankles for one week; black and blue spots; nose bleed.	Scurvy
R. A.	1 year, male	Cow's milk formula from birth; a lump of butter daily; orange juice only occasionally.	Pain in back of the neck and in both legs; bleeding from gums; four plus Wassermann test.	Scurvy, rickets
B. J. B.	10 months, female	Mellin's food from birth; no orange juice or cod liver oil given.	Pain in back and legs; swelling of legs; gums swollen and bleeding.	Scurvy, rickets
A. C. (1)	8 months, female	Formula with cow's milk first three weeks; then malted milk with Imperial Granum; no vegetables, cereal, orange juice, or cod liver oil given.	Stiff leg for four weeks; gums blue and swollen.	Scurvy
G. P.	8 months, male	Cow's milk formula first two weeks; Eskay's food since, but with no orange juice or cod liver oil.	Pain on touch.	Scurvy
E. P.	10 months, female	Cow's milk formula from birth, with nothing else.	Pain in leg for seven weeks.	Acute rickets, scurvy
B. B.	9 months, female	Bottle-fed since she was three weeks old; no cereal, vegetables, or orange juice; cod liver oil (1 teaspoonful) once daily.	Pain in body for three weeks; gums purple.	Scurvy, abscess of upper eyelid
M. J. O.	3 months, male	Eagle Brand milk and S. M. A. from birth.	Fever and pain in body.	Scurvy, acute pyelitis
T. G.	10 months, male	Cow's milk was given for from 7 to 10 days; then Horlick's malted milk and S. M. A.; occasionally orange juice.	Pain in legs; loss of weight; swollen and bleeding gums.	Scurvy
A. C. (2)	5 months, male	Milk and strained oats; no orange juice or cod liver oil.	Swelling under both eyes.	Scurvy
D. S.	1 year, male	Certified milk with dextri-maltose; orange juice given first six weeks, cod liver oil for one week.	Pain in legs for three weeks; red gums.	Scurvy, chronic rickets

its administration. Other vitamin requirements, especially cod liver oil, also seem to have been neglected in many cases. Solid foods have not been given adequately in the majority of the cases. The most remark-

able fault in this series lies in the infrequent use of vegetables. These cases, then, demonstrate very clearly that scurvy in infants is a result of lack in fundamental vitamin requirements, as well as of neglect in the

more liberal use of solid foods, especially the vegetables.

Age incidence is also very suggestive. There is a striking agreement as to the time when the disease most frequently occurs.

purplish eyelids. Loss of weight is a rather constant symptom, resulting from loss of appetite. Petechial hemorrhages on the skin are sometimes met with. With the hemorrhage along the shaft of long bones,

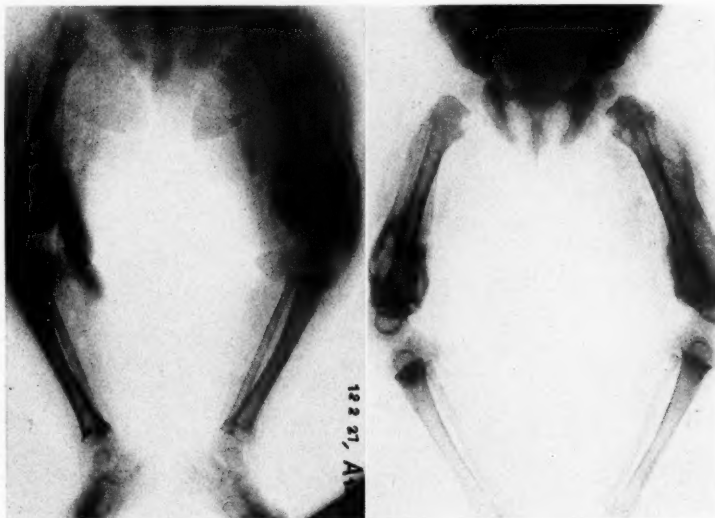


Fig. 2 (left). Same patient shown in Figure 1. The anteroposterior view of both legs, Dec. 2, 1927.

Fig. 3 (right). Same case as shown in Figures 1 and 2, Jan. 13, 1928.

The majority of these patients are between 8 and 14 months, except two whose age, when scorbutic symptoms first appeared, were three and five months, respectively. From their history and the roentgenograms, they may be regarded as cases of unmistakable scurvy in its latent or early second stage.

As to the symptoms and signs, practically every case gives two typical manifestations, namely, pain on motion, particularly of the legs, and swelling and bleeding from the gums. One patient gives a history of having lost some teeth as a result of the disease. Another gives one of the most remarkable manifestations of hemorrhage, namely, exophthalmos, due to the post-orbital hemorrhage. The right eye of this patient was quite prominent with very edematous and

elevating the periosteum, there is often an appearance of swelling and edema of the extremities. Fever may, or may not, be present. In one patient with fever, there was a complicating acute pyelitis.

The blood picture in scurvy is worthy of attention. Often there is a complaint of pallor which gradually increases in severity with the progress of the disease, usually due to anemia secondary to hemorrhage. In our series, the lowest erythrocyte count was 2,180,000 with 23 per cent hemoglobin. In this patient, the blood smears showed numerous nucleated red blood cells. In many of our patients, there are other signs of anemia, such as achromasia, anisocytosis, and polychromatophilia. Poikilocytosis is practically never found. There seems to be a more or less constant leukocytosis, up to

21,000, with relative increase in polymorphonuclear neutrophils. In one case which showed leukopenia with a decrease in granulocytes, the outcome was fatal, indicating a loss of resistance.

possible to illustrate every case in this series with all the roentgenograms which have been made. Such films as are truly illustrative of special points of clinical value are reproduced in the accompanying figures.

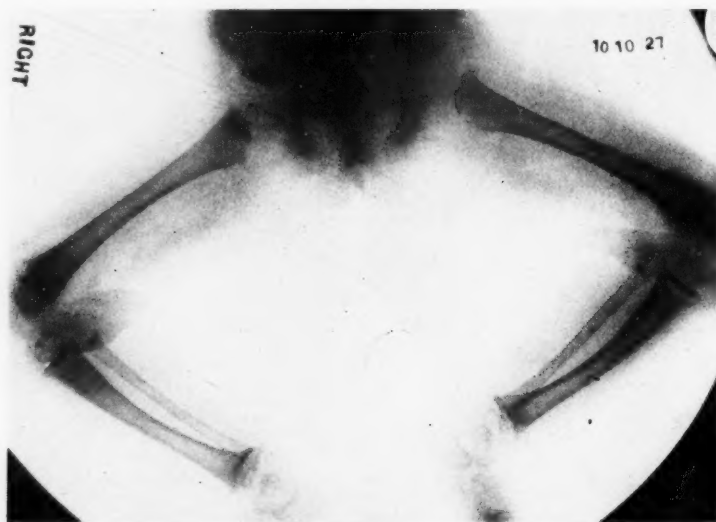


Fig. 4. Lateral view of both legs of female patient, B. B., 10 months old, Oct. 10, 1927.

The treatment routinely adopted in the hospital consisted of the daily administration of fresh orange juice in large quantities, together with an adequate dietary régime, including the liberal use of solid foods. Up to eight ounces of orange juice were given to these patients each day. The course of the disease was favorable in the majority of cases, as a rule, the acute symptoms subsiding within a few days. Calcification of hemorrhages, if any, commenced in about two weeks. Some cases were followed up in the Out-patient Department, and complete healing of the affected bones was proved by roentgenologic examinations many months after the attack of the disease.

In infantile scurvy, the roentgenologic study of the epiphyses of long bones is as interesting as it is valuable, from the standpoint of diagnosis and prognosis. It is im-

The three films from the patient, E. P., 11 months old, are of extreme value in following the course of subperiosteal hemorrhages in the lower extremities. According to the history, the first symptoms of the disease were noticed on Sept. 25, 1927. The first roentgenogram (Fig. 1), made 50 days afterward (November 16), shows a well-marked line of temporary calcification at the lower end of the femur, and the ends of both tibiae and fibulae. Immediately shaftward to this zone of increased density, there is a narrow zone of decreased density, especially noticeable in the lower end of the femur and the upper end of the tibia. Thus, the film in this case shows an unmistakable Trümmerfeld zone. Furthermore, there is a generalized atrophy of the shaft, though only moderate in degree, especially noticeable in the body of the fibula, as evidenced by the

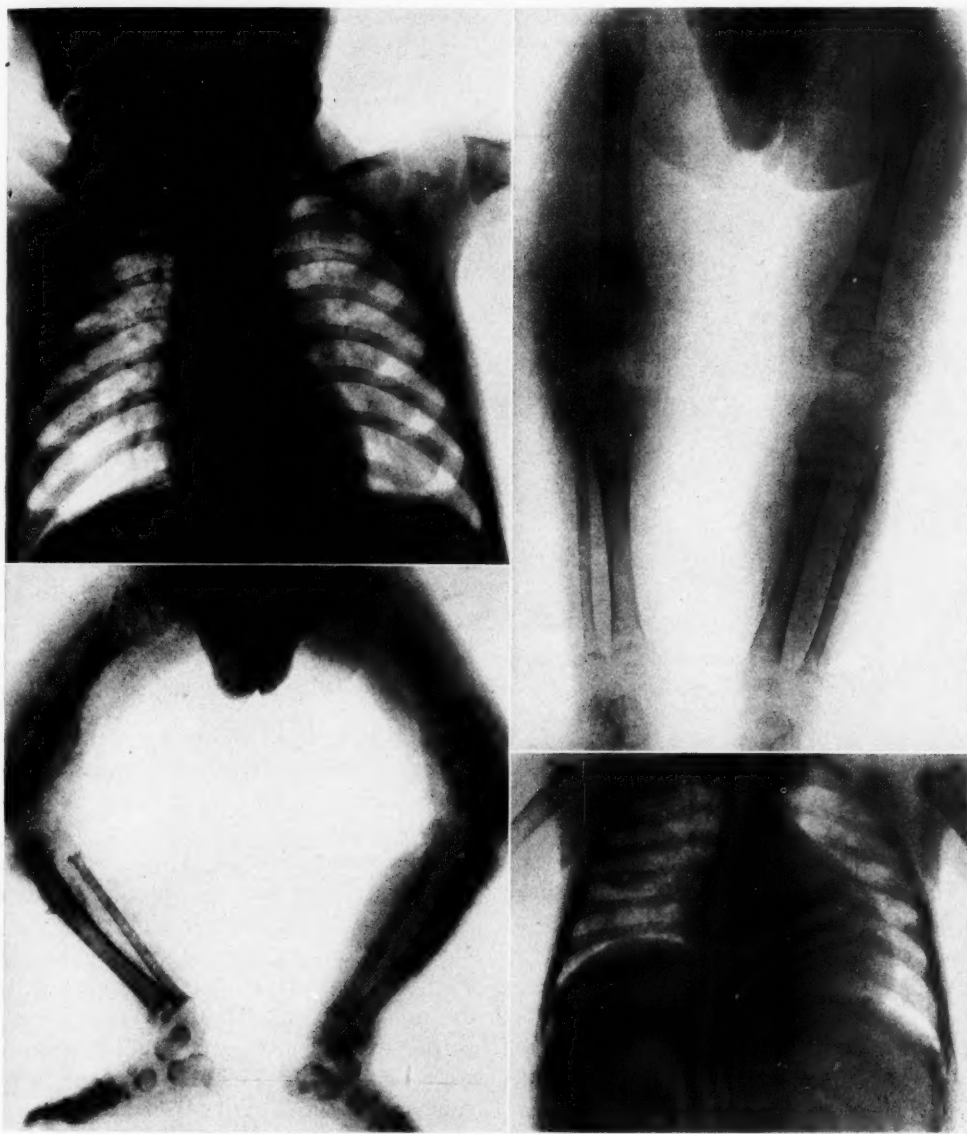


Fig. 5 (*upper left*). Chest of same patient shown in Figure 4, Oct. 14, 1927.
 Fig. 6 (*upper right*). Anteroposterior view of both legs, case of J. A. P., April 8, 1929.
 Fig. 7 (*lower left*). Lateral view of both legs, same case as shown in Figure 6, April 16, 1929.
 Fig. 8 (*lower right*). Chest of same case as shown in Figures 6 and 7, April 8, 1929.

ground-glass appearance of the medullary portion and a thinning of the cortex, well visible in all the bones shown on the film. Another point, frequently overlooked at this stage, is a suggestion, or rather a beginning,

of the lateral spur formation. The mere fact that the zone of preparatory calcification is separated from the diaphysis by means of the zone of decreased density makes the lateral ends of this line appear

particularly prominent. This is suggestive of a spur, even though there is no actual dislocation or displacement of the hypercalcified line.

Another very constant sign at this stage

of the femur. There is no sign of hemorrhage in the lower legs.

The third film (Fig. 3), taken 27 days after the second, is equally spectacular in that the hemorrhages are now being organ-

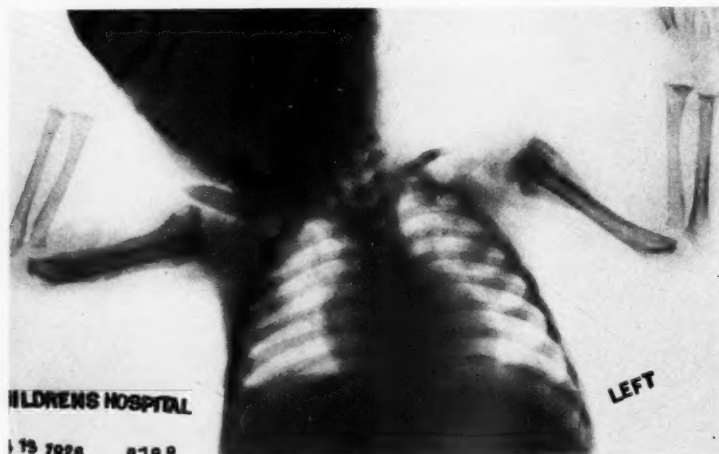


Fig. 9. Chest and upper extremities, case of R. A., year-old male infant, April 13, 1926.

is the so-called Wimberger's sign, which is the edging or rimming of the nucleus of ossification in the epiphysis by a comparatively dense, yet thin, line, its central portion having a typical ground-glass appearance. This gives a peculiar ring-like shape to the oval, or roughly spherical, center of ossification. This sign is found in all epiphyses at the ends of long bones, as well as in the small bones of the wrist and the ankle, as pointed out by Schwartz. It is interesting to note that in this film there is no suggestion of hemorrhage anywhere.

The second film (Fig. 2), taken 18 days after the first, is a very spectacular picture in that the most outstanding phenomenon is the extensive hemorrhage all along the shaft of the femur on both sides. The epiphyses appear to be dislocated, and this dislocation is sometimes called epiphyseal separation. (The outer contour of the hemorrhagic mass seems to be continuous with the line of hypercalcification at the lower end

ized and there is an absorption of the hematomas as well as fairly well-marked calcification. The epiphyses still appear separated.

In the next patient, B. B., 10 months old, in whom scurvy had its onset about two months before the first film (Fig. 4) was made, we fail to find all the remarkable roentgen signs of the disease manifested in the previous case. The generalized osteoporosis of the shaft of long bones is evident, with unmistakable Wimberger's sign. The epiphyses of the lower ends of both femora appear to be jammed up against their metaphyses, which is a variety of epiphyseal separation. No hemorrhage was noted in this patient at any time. The Trümmerfeld zone is distinct at the upper ends of both tibiae, while the lower ends of both tibiae reveal destructive lesions which closely resemble those found in rickets. The roentgenologist's comment on this film was "Rickets and scurvy, the latter predominat-

TABLE II.—BLOOD PICTURE IN INFANTILE SCURVY (13 CASES)

Case	Erythrocytes	Leukocytes	Hemo- globin (Percent- age)	Differential count				
				Polymor- phonu- clears	Lympho- cytes	Eosino- phils	Baso- phils	Transi- tionals
J. O. P.	2,180,000	15,900	23	29	66	1	1	3
X. H.	4,080,000	11,450	70	60	40	--	--	--
D. W.	3,680,000	12,570	65	68	32	--	--	--
R. A.	3,830,000	21,600	55	70	30	--	--	--
B. J. B.	4,560,000	10,800	60	43	51	--	--	1
A. C. (1)	4,120,000	13,840	70	50	44	--	--	6
E. P.	3,660,000	20,370	60	73	26	--	--	--
B. B.	4,570,000	10,020	60	33	65	--	1	1
M. J. O.	3,010,000	14,000	43	66	32	--	--	2
T. G.	3,140,000	11,140	40	55	44	--	1	1
A. C. (2)	4,320,000	5,411	75	12	87	--	--	1
D. S.	4,000,000	13,200	48	40	52	1	1	6

Note—The blood of patient J. O. P. showed 32 nucleated reds in counting 200 white blood cells.

In patient R. A., the blood smear showed hypochromasia and polychromatophilia.

In patient M. J. O., the smear showed anisocytosis, achromia, and polychromatophilia.

The smear of patient T. G. showed slight achromia and anisocytosis.

The patient B. J. B. showed very slight achromasia and polychromatophilia.

ing." The fact that such lesions are often found in scurvy is proved by the similar changes seen in the lower ends of the tibia and the fibula in our next patient. Clinically the patient showed typical symptoms of scurvy, namely, pain on motion, particularly in the back and in the legs, with swollen, blue gums. This case is of special interest in that, about two years later, a follow-up roentgenogram was made which revealed a complete healing of bone lesions, but the epiphyses at the upper ends of both tibiae showed the growth arrest line in the form of a rarefied elongated oval inset within the nucleus of ossification.

Very important roentgenologic findings in the chest film of this patient (Fig. 5), taken Oct. 14, 1927, were the rounded swellings seen at the costochondral junctions of the ribs. This is the scorbutic beading of the ribs, frequently found in little patients suffering from infantile scurvy, quite analogous to the rachitic rosaries. It is of great interest that the beading of the ribs had almost completely disappeared in the next film, which was taken as a follow-up record 22 months after the previous examination.

As this phenomenon is more frequently

associated with the rachitic process than with scurvy, the two diseases have often been confused. There is still found to-day in the literature peculiar and vague combinations of terms, such as "scurvy rickets," used by some writers as synonymous with "infantile scurvy" (13). The hospital records also indicate the same confusion, as these cases are usually filed under a double classification of "scurvy" and of "rickets."

The next patient, J. A. P., one year old, presented a remarkable clinical symptom of exophthalmos of the right eye. Both eyelids were purplish-red in color, indicating ecchymosis in the subcutaneous tissue. There was no fever and, therefore, no evidence of this being due to any suppurative condition. The patient was exceedingly pale and anemic, the hemoglobin being 23 per cent (Sahli), with 2,180,000 red blood cells. The roentgenogram of the lower extremities (Fig. 6), made about two months after the onset of symptoms, shows bilateral dislocation of epiphyses on both sides at the lower ends of both femora, with a considerable amount of bone destruction at the metaphyses. There is a slightly noticeable beginning hemorrhage at this point, causing a

line of hypercalcification to be indistinct and to appear as definitely separated. Similar changes are noted at the upper ends of both tibiae, and there is a definite hematoma on the upper end of the left tibia. The lower ends of both tibiae and fibulae also show definite changes. The generalized osteoporosis of all these bones, resulting in loss of trabeculations and thinning of the cortices, and the similar atrophy of the epiphyses with positive Wimberger's sign are most characteristic of the transition from the second to the third stage of the disease. It is also worthy of note that the fibula, particularly on the left, appears to be dislocated and its head separated from that of the tibia, due, evidently, to the hemorrhage which is taking place at the metaphysis of the tibia.

It is to be added, furthermore, that this case also shows some lesions, particularly at the lower ends of both tibiae and fibulae, which closely resemble those found in rickets. The presence of these changes can be explained more satisfactorily by the generalized bone changes due to scurvy than by assuming a co-existence of rickets.

The film (Fig. 7), taken after eight days of intensive treatment in the hospital, reveals extensive hemorrhages along the shafts of both femora and both tibiae. This is a remarkable film of a very severe form of infantile scurvy, characteristic of the third stage. An interesting finding on this film is the presence of a well developed Trümmerfeld zone at the upper ends of both femora, particularly well seen on the right side. Another film (Fig. 8) from this patient shows typical lateral spurs at the upper ends of both humeri, with a well marked Trümmerfeld zone. The lower ends of the radii and ulnae also show typical changes. Generalized osteoporosis is evident, but no hemorrhage is noted. It is also interesting to note on this film the beading of the costochondral junctions of the ribs, quite similar to that found in the previous case. As the

film was made with the patient lying on his back, these swellings are not so clearly outlined as in the other case, but they are sufficiently clear for our recognition.

In the next patient, R. A., one year old, the film (Fig. 9), taken about two months after the first symptoms of scurvy were noted, shows extensive hemorrhages on both humeri, more marked on the right. The hemorrhage appears to be undergoing early calcification, which is the beginning of the fourth stage of infantile scurvy. The beading of the ribs is also receding, and the radius and ulna show typical changes at their distal ends. Generalized atrophy of the body of long bones and thinning of the cortex are also evident on this film.

The present series of cases illustrates fairly well the more important roentgen signs of infantile scurvy which have been accepted as pathognomonic of the disease. On the whole, the disease can be readily diagnosed without confusion when the typical clinical signs are present. This corresponds to the second stage from the standpoint of roentgenology. During the first period, in which the clinical signs are so indefinite that a correct diagnosis is impossible, roentgenology comes to the aid in establishing the diagnosis.

✓ Pelkan is able to diagnose latent scurvy by the roentgenologic triad, consisting of (1) the broadened epiphysis, (2) the dense shadow around the center of ossification of the epiphysis, and (3) the absence of trabeculations in the shaft. This is an important contribution to pediatrics as well as to roentgenology, for it is a common experience to see cases diagnosed as nutritional disturbance, in which the usual symptoms are pallor, loss of appetite, and failure to gain weight, which, in fact, may be latent or borderline cases of infantile scurvy. The fact that automatically high-vitamin diet is prescribed to these patients, with favorable results, does not excuse pediatricians for not

having made a correct diagnosis with the aid of roentgenology.

THE ROENTGEN SIGNS OF INFANTILE SCURVY

Many references are found in the literature on the roentgen signs of scurvy. Beginning with the work of Fraenkel in 1904, Baetjer, Wimberger, Pelkan, Schwartz, Bromer, and finally McLean and McIntosh, have each contributed very illuminating discussions of these signs in the differential diagnosis of infantile scurvy. After a perusal of these excellent papers, the question naturally arises, "Are these signs truly pathognomonic of infantile scurvy?" A brief discussion of each of these signs may be of interest.

There are at least ten roentgenologic signs found more or less constantly in well-developed cases of infantile scurvy, which may be stated as follows:

1. A finely irregular, broadened, intensely calcified zone of preparatory calcification at the epiphyseal end of long bones, the so-called "white line" of Fraenkel.

2. A small spur at the lateral edge of the epiphysis (Pelkan).

3. A zone of rarefaction immediately back of the zone of preparatory calcification, the "scurvy line" (22), the "framework marrow" (6), or the "Gerüstmark" (25).¹

4. A broad, finely irregular edge of dense shadow encircling the nucleus of ossification at the epiphysis, together with rarefaction of the central portion, "Wimberger's sign." This has been shown in the centers of ossification in the carpal and tarsal bones (26).

- ✓ 5. Separation of the epiphysis.

6. A ground-glass transparency of the shaft, with clouding or obliteration of the trabecular structure which is visible in normal bones.

7. A thinning of the cortical shadow, often represented merely by a narrow white line.

8. Subperiosteal hemorrhage and evidence of hemorrhage into the soft parts.

9. Subperiosteal fractures in the ends of the diaphysis.

10. Enlargement and angulation of the costochondral and of the vertebral junctions of the ribs.

The first of these signs, namely, the prominent zone of preparatory calcification, which is very striking in scorbutic bones, is, however, not absolutely characteristic. This line represents in general the results of hypercalcification which may be due to either of two causes. The arrested length growth of long bones may cause a piling up of calcium salts at the place of greatest activity, or it may be the result of a deposit of some other abnormal substances. The majority of cases showing this zone of increased density appear to be due to hypercalcification, but at present evidences are still insufficient to conclude that substances other than calcium may not be responsible for the production of this line.

Recently increasing evidence seems to be accumulating which goes to prove that similarly dense lines are produced unmistakably by such conditions as chronic lead poisoning (Vogt, Caffey, Park, etc.), and after a prolonged administration of phosphorus (28) or cod liver oil containing phosphorus (23). Viosterol, which is now being employed clinically in increasing measure, may give rise to a similar dense shadow at the metaphysis.

Lehmann speaks of "year rings" in connection with celiac disease. The lines of hypercalcification at the ends of long bones, associated with areas of distinct rarefaction in the metaphyses, have been seen on the roentgenogram of a fifteen-month-old child who received an intensive anti-rachitic treatment with phosphorized cod liver oil. A general interest now prevailing in the

¹On account of great confusion and ambiguity connected with the term "Trümmerfeldzone," it appears advisable to drop the term in the discussion of infantile scurvy, as no two authors use it with the same connotation.

study of various conditions under which this zone may be produced will undoubtedly reveal many other factors in addition to hypercalcification. Thus, we are led to believe that this line is not a sign peculiar to scurvy. The so-called transverse lines described in detail by Eliot, Souther, and Park (8) have no relation to this line, but they are other examples of similar shadows produced under apparently normal conditions.

As to spur formation at this zone of increased density in moderately severe stages of scurvy, it is generally agreed that this may also be present in other conditions, especially rickets. The spur is said to occur in scurvy under three different conditions: (1) in association with lateral separation of the epiphysis, the line of cleavage being in the zone of rarefaction; (2) as an early sign of organization and calcification of a subperiosteal hemorrhage, and (3) more rarely without any demonstrable epiphyseal separation or subperiosteal hemorrhage. In rickets, a spur may be seen on a roentgenogram, merely as a matter of contrast between the area of preparatory calcification and the swollen cartilaginous tissues. The distinguishing feature is said to consist in the fact that the lateral spur of scurvy is always at the right angle to the longitudinal shaft of the bone, while in rickets the direction of the projection is often in the direction of the joint. This, however, is not always the case, especially in view of the fact that, in scurvy, the spur is not seen as a solid and uniform projection but may assume variable forms according to the degree of hypercalcification as well as the angle from which the roentgen ray is cast. McLean and McIntosh apparently appreciate this difficulty when they remark, "Consequently the most that can be said in interpreting such a film is that there is some extension outward from the expected margin of the zone of preparatory calcification, the nature of which cannot be more precisely defined."

By far the most important roentgen sign of infantile scurvy is the zone of rarefaction, found just behind the zone of preparatory calcification at the end of the diaphysis. This has been called the scurvy line by Pelkan and the zone of framework marrow (Gerüstmark) by Bromer and others. It is represented on the roentgenogram as an area of varying width immediately adjacent to the line of hypercalcification. This zone is apparently produced by a process of increased destruction of trabeculae, or, rather, a failure of the osteogenetic process. It is believed by some that the normally calcified trabeculae are replaced by the fibrous marrow in this region; this process is thought to be peculiar to scurvy. There is, however, one other condition in which this area of rarefaction is frequently present, namely, congenital syphilis. The differentiating points between these two conditions have been discussed by many authors. It must be emphasized here that, when the punched-out, rarefied areas in congenital syphilis happen to be grouped in a row just behind the line of hypercalcification, in appearance they may simulate very closely the scurvy lines. It must be admitted, however, that the presence of this scurvy line is one of the most reliable signs of infantile scurvy on a roentgenogram. Congenital syphilis is usually seen in much younger infants with clear-cut history and other signs which aid in unquestionable diagnosis. These points have been adequately discussed by Alexander and Fraenkel. Hartman and Friedman report true scurvy in a seven-year-old child in whom the "Trümmerfeldzone" and "Gerüstmarkzone" were both lacking.

▼ The dense edging of the periphery of the epiphyseal center of ossification and the rarefaction of its center are analogous in pathogenesis to the increased density of the metaphysis, with its concomitant area of rarefaction immediately shaftward at the end of the long bones. This phenomenon is known in the literature as Wimberger's

sign, although attention was first called to it by Reyher, in 1912, and by Gött, in 1919. It was Wimberger, however, who insisted that this sign was specific in scurvy. But it has since been pointed out by several authors that this sign is by no means limited to scurvy; it may be found in such conditions as rickets, lead and phosphorus poisoning, as well as in some other forms of metabolic disturbances. Hence, it is impossible to regard this as an absolute sign in the diagnosis of scurvy. In this connection, it is also interesting to note the persistence of this rarefied area in the epiphyseal center of ossification long after recovery from the disease has taken place. This is well demonstrated in one of our patients, a roentgenogram of whom, taken 22 months after the first was made, shows a light circular area in the very core of the lower epiphyses of both femora and the upper epiphyses of both tibiae. It is to be added that McLean and McIntosh observed similar "scars" in a patient with acute lymphatic leukemia as well as in a patient with anemia of the von Jaksch type.

"Separation of the epiphysis" has been regarded by many as a term not strictly accurate in the description of the actual pathology which takes place at the ends of long bones in scurvy. It was Wimberger who proposed to substitute the term "separation of the metaphysis," for the line of cleavage is not through the epiphysis but through the metaphysis, the displaced epiphysis carrying with it the zone of preparatory calcification. Moreover, it has been particularly emphasized by McLean and McIntosh that this separation of epiphysis should include not only the cases in which the epiphyseal center is displaced laterally or anteroposteriorly, causing a distortion of alignment with the main axis of the shaft, but also those in which the dislocation takes place toward or away from the end of the bone even though there is no

actual distortion of alignment. In lateral displacement, we have the formation of lateral spurs, but in longitudinal dislocation, the abnormality is found in an undue widening of the zone of framework marrow or of rarefaction, because of the pull which is exerted by the centrifugal separation. Or it may appear as a jamming-up of the metaphysis with a narrowing, or at times almost an annihilation, of the zone of rarefaction due to the centripetal dislocation of the epiphyseal end. This phenomenon, which is very characteristic, may be regarded as one of the more reliable roentgen signs of scurvy. However, it must be remembered that, in congenital syphilis and osteogenesis imperfecta, such a separation may also take place. The distinguishing feature consists in the position of the line of preparatory calcification with reference to the epiphysis.

Ground-glass appearance of the shaft of long bones has been pointed out, particularly by Pelkan and Bromer, as being frequently found in scurvy. The latter considers this one of the roentgen signs of scurvy in its latent stage, when there are no clinical symptoms. With perfect radiation technic, the phenomenon is found to be due to the loss of trabeculation, caused by the atrophy of the spongiosa. This is very frequently found in scurvy, as our figures indicate, but McLean and McIntosh state that they were able to find this phenomenon in only one-fifth of their cases. That this is not specific for scurvy is shown by the fact that the similar appearance of the medulla of long bones is found in many other conditions, such as rickets, paralyse of many causes, and certain cases of chronic intoxication. Therefore, the emphasis placed on this phenomenon as a distinguishing feature of scurvy, in contrast with that of coarse trabeculation sometimes found in rickets, is not tenable.

The same applies to the thinning of the cortex, which is also regarded by some as

being specific for scurvy during the early stage. But this also is not constant. Its presence alone can never be interpreted as diagnostic for scurvy, as any other condition which causes bone atrophy is likely to produce a similar phenomenon.

Subperiosteal hemorrhage is very frequently found in a severe, acute form of scurvy. It usually seems to be preceded by epiphyseal separation, as it appears to begin at the point of separation, gradually burrowing beneath the periosteum. Due to the disease process, the latter is greatly weakened. The hemorrhage, which may be so extensive as to cover the entire length of the bone involved, is clearly demonstrated in our cases. When present, periosteal hemorrhage is so characteristic that it may be regarded as one of the most reliable roentgen signs of scurvy during its third stage. As healing takes place, the hematoma gradually becomes organized and calcification sets in, with final absorption. With subperiosteal hemorrhage, there may be hemorrhage into the soft parts, but this is of rare occurrence and, for practical purposes, it may be disregarded as a sign of scurvy.

Subperiosteal fractures have been observed by McLean and McIntosh. These occur in the spongy bone at the end of the diaphysis and are usually without a definite line of cleavage, but show a collapse or buckling of the trabecular structure at that point. Fractures, however, are not frequent and constant and, therefore, cannot be regarded as specific for scurvy. When they occur, the condition must be clearly differentiated from rickets, osteogenesis imperfecta, congenital syphilis, and other conditions in which such fractures are also frequently seen.

There is one other roentgen sign of scurvy, often overlooked by some observers and frequently confused by others, namely, the beading of costochondral junctions of the

ribs. McLean and McIntosh fail to mention this sign, although they briefly mention epiphyseal separation, clearly visible as lateral displacement of the zone of preparatory calcification of the diaphysis, at the vertebral ends of several of the ribs. This is a very interesting point, and has received little attention from roentgenologists. The most characteristic changes are found, however, at the costochondral junctions of the ribs anteriorly. During the second stage of the disease, we frequently find a row of swellings, either rounded or angular, along both sides of the sternum. This, called scorbutic beading of the ribs, is quite analogous to rachitic rosaries. Barlow himself states, "The sternum, with adjacent costal cartilages and a small portion of the contiguous ribs, appear as though they had been fractured by a blow from the front and had been forced backward." Hess points out that this beading has been frequently regarded as caused by rickets; hence confusion has arisen in many cases, resulting in an erroneous diagnosis of co-existence of rickets and scurvy. Beading, however, is quite characteristic of scurvy as well as of rickets, although in scurvy it is caused by epiphyseal separation. Thus the beading may be rounded, smooth, knobby in character, or it "may have an angular feel on palpation, the junction taking on a step-like form, as if the abutting ends of the cartilage and the bone were of unequal size and not well fitted to each other." This phenomenon is well illustrated in our Figure 9, in which the sternal ends of the ribs are seen to be enlarged, with characteristic zones of preparatory calcification.

CONCLUSIONS

If the above interpretation of the various time-honored roentgen signs of infantile scurvy is at all correct, there is but one conclusion to draw. The majority of these signs are not pathognomonic. The contin-

ued use of such terms as the "Trümmerfeldzone" and "Wimberger's sign" as diagnostic of infantile scurvy leads to confusion. Pelkan's triad in the diagnosis of latent scurvy is a very valuable adjunct, but it is not absolutely characteristic. Beading of the ribs is common both to infantile scurvy and rickets. Separation of epiphyses is most frequently found in infantile scurvy, but it may also be found in other conditions. The white line of Fraenkel is the least characteristic of scurvy, for it is merely a phenomenon of hypercalcification at the end of a long bone, which is seen in many diverse pathologic conditions.

The one sign which is absolutely unique in infantile scurvy is that of subperiosteal hemorrhage during the third stage of the disease. This can be only inferred clinically upon examination of the limbs in the light of a suggestive history, but the final diagnosis must rest on roentgenology.

A conclusion such as this is not to be interpreted to mean an attempt to minimize the diagnostic value of roentgenology, but rather to emphasize the necessity of broadening the experience of both clinicians and roentgenologists in proper evaluation and interpretation of the roentgen signs of infantile scurvy.

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U. S. X-ray Standard Lessens Danger of Burns.—The danger of burns during X-ray treatments has been greatly lessened, according to Dr. Lauriston Taylor, of the U. S. Bureau of Standards, by the completion and final testing of apparatus designed to measure the intensity of X-ray doses.

"Until now, no exact and uniform measurement of the strength of X-rays has been possible," said Dr. Taylor. "Now a doctor may calibrate his apparatus to learn the intensity of his X-ray doses without the necessity of guesswork. He will not burn his patient, nor will he commit the worse crime, in cases such as cancer, of undertreating him."

According to Dr. Taylor, there are two factors in X-ray treatment, the intensity and the penetrative power of the ray. The ray's penetrative power depends on the shortness of its wave length, longer waves having a burning effect. The intensity of the X-ray dose is more important, and it is this intensity which he can now measure.

For three months Dr. Taylor experimented in European national standardizing laboratories, consulting foreign scientists and comparing his apparatus with theirs. Before that he labored at his instruments in the Bureau of Standards to construct a portable X-ray standard, finally building one which is so simple that he could take it with him, and so accurate and dependable that it is designated as the primary or final standard of the United States. This he compared with foreign instruments, drawing up with European scientists specifications for an international standard to remedy

international confusion. This new apparatus is the only one in the world that completely satisfies these specifications, Dr. Taylor says.

Uncle Sam's X-ray yardstick is in reality a small metal chamber into which X-rays are projected in a steady, uniform beam. When the rays pass through the air in this chamber they ionize the air, that is, set loose free electrons. This causes the air to become a partial conductor of electricity, which may be measured by an electric current and meters. The strength of this current depends on the strength of the X-rays.

France, Dr. Taylor said, had been comparing X-rays with radium emission, but the X-ray intensity as thus measured varied with the ray's wave length. The English laboratories did not guarantee steady and uniform transmission of the ray being gauged. The American apparatus does away with both difficulties, and furnishes as nearly as possible a means for transmitting, maintaining, and measuring a ray of uniform and standard intensity independent of all other conditions. For this reason France, Egypt, and several other countries have adopted Dr. Taylor's specifications outright, and other countries have drawn up specifications which at present his apparatus alone fits.

"It is now up to the Bureau," Dr. Taylor said, "to find a means for gauging exactly the penetrative qualities of the various X-ray wave lengths. The intensity of a ray used in medical treatment is but half the problem. Not until we have both standards can we call our standardization work complete."—*Science Service.*

THE DOLICHOCOLON

By F. D. LAROCHELLE, M.D., and E. E. SMITH, M.D., SPRINGFIELD, MASSACHUSETTS

REDUNDANCIES or elongations of the colon with loop formation have been observed by radiologists for a number of years, but it is only recently that the condition has been recognized as a definite clinical entity. The symptoms that arise from this condition are generally pronounced constipation, meteorism, and indefinite discomfort over the colon, associated with vague general symptoms such as indigestion, loss of weight, and insomnia. The patient complains of rumbling following the use of laxatives and cathartics, with only partial evacuation. The liquid intestinal contents are swept down by an exaggerated intestinal peristalsis to the elongated and dilated loop that acts as a trap and arrests the intestinal flow.

This condition has been variously described as elongation or redundancy of the colon with loop formation. Recently Chiray (1) has coined for this anomaly the term "Dolichocolon" from the Greek "δολιχος." The great advantage of such a term is that it can be transferred from one language to another without the necessity of translation, and the search of the literature is greatly facilitated.

It is impossible to give an exact definition of this condition, for, while the clinical features are fairly well established, the mechanism of the disease is anything but clear. While we must differentiate between elongation and dilatation of the colon, in most instances it appears that both factors are at work. Since we have become familiar with this condition, we have seen a number of patients presenting this ailment, and we can recall a number before that time whom we then classified erroneously as suffering from simple constipation.

By dolichocolon we understand an elonga-

tion of one or more segments of the colon. Another view is that this condition is due to a generalized elongation of the colon and that the redundancy and loop formation are but manifestations of an attempt of the colon as a whole to adapt itself to the abdominal cavity. Yet another view is that the condition is a form of megacolon in which the augmentation in length has been greater than the accompanying increase in caliber.

Anatomically, the dolichocolon is an elongation of the colon, most often involving one segment, usually the descending, resulting in flexures, loops, and kinks in the lumen of the gut. This may be accompanied by dilatation of the affected segment.

This condition was first recognized by pathologists, who, however, made no attempt to associate these findings with definite clinical symptoms. The work of Lane served to make diagnosticians conscious of these deformities and the advent of X-rays and the barium enema made it easy to recognize these anomalies during life.

White (2), of Boston, reports that he found this condition in from 4 to 5 per cent of patients presenting gastro-intestinal symptoms; this figure has been accepted as about the average incidence of the disease. Certain authors observed the condition more often in women than in men, but there is some doubt about this. All are agreed that it is more common in adult life and, although there may be exceptions to this, the individuals affected are usually of the viscerotonic type. Our youngest patient was a 5-year-old female, the oldest, a 72-year-old man. While the condition may affect any part of the colon, it is by far more common in the sigmoid.

Numerous explanations have been offered but none is entirely satisfactory. It is prob-



Fig. 1. A typical dolichocolon involving the sigmoid. Note the elongated sigmoid and the gas dilatation of the rectum.

ably fair to assume that all the factors enumerated are partly true, and that the resulting condition is a composite one, with emphasis on one or more features. While some authors think that the ailment is a congenital one, others believe that it is acquired. Pauchet claims that it is due to constipation. Zorzi thinks that the condition results from a derangement of the autonomous intestinal nervous mechanism. Others emphasize diet deficiencies or endocrine derangements as etiologic factors. At this time, the question cannot be definitely answered. An important fact to remember is that, whatever the condition may be, it can be made to disappear by medical measures and this would indicate that it is largely a functional derangement if there is a definite anatomic basis.

Why is the condition most common in the sigmoid? The sigmoid flexure is normally a reservoir. Dolichocolon is very likely an exaggeration of this function, in cases in

which the dimensions of the gut have exceeded normal anatomic limits and it is unable to regain its usual caliber. In a number of patients suffering from this condition, anal spasm can readily be recognized; it is natural to assume that this may be part of a spastic condition of the whole colon.

There are two distinct types of this disease: one associated with mucous colitis and spasm, and the other dyspeptic, with loss of appetite, indigestion, loss of weight, and indefinite discomfort in the abdomen.

The two complications that have been found are pericolic abscess and intestinal obstruction, but since these are rare and present no unusual features, they are not considered here.

In patients suspected of this condition, before undertaking examination of the



Fig. 2. Elongated coils of the sigmoid without dilatation. Normal stomach and small intestine.

colon, it is absolutely necessary to make a general examination. If the colon is examined first, some local lesion may be found that seems to explain the symptoms. The tendency then is to stop the study, but, if this is done, one can readily overlook other anomalies that might be of greater importance. Once it is definitely established that no other pathologic condition exists, attention is focused on the colon. The anus and anal canal are examined in the usual manner, a sigmoidoscope being introduced to exclude any lesion of the ascending colon involving the mucosa. Then the colon is emptied and washed by means of colonic irrigation. It may be necessary to repeat this, as oftentimes an unusual accumulation exists that is not readily dislodged at the first attempt. A barium enema, which is usually sufficient to demonstrate the condition, is then given to fill the entire colon, and plates are made. Once the condition is recognized, it is well to empty the colon by another irrigation, because, if the pathology is marked, damage, or certainly discomfort, might result from retention of a large amount of barium in the elongated loop. Then the patient is given barium by mouth and another plate is made in 24 hours. This demonstrates the condition conclusively.

TREATMENT

Many patients go on for years with this condition, with no other treatment than is usually practised for ordinary constipation. However, they invariably tell us that ordinary laxatives and cathartics do not have the usual effect, more relief being afforded by an enema, although the discomfort is only partly relieved by the enema. The wave of enthusiasm for surgical treatment of this condition has passed now. It should be reserved for very special cases, and then only with great circumspection. It is probable that the results from surgical treatment have fallen far short of expected results.



Fig. 3. Elongation of the descending colon, with dilatation of the sigmoid in a child five years of age.

If this condition is to be permanently relieved, we must first empty the whole colon, and then restore the normal tone of the colonic walls. After emptying, suitable diet with lubricants will facilitate the passage of intestinal contents through the elongated loop, leading to a disappearance of the exaggerated reservoir function of the affected segment. There can be no doubt but that this can be accomplished by medical measures.

In the way of laxatives, oil and agar emulsions with phenolphthalein are satisfactory; if necessary, a laxative pill can be given occasionally. During the first weeks of treatment, nothing will replace colonic irri-

gations. These empty and wash the colon, and repeated dilatation and contraction of the muscular walls combat the existing atony.

While this condition is largely a local lesion, there are constitutional factors that must not be overlooked. Attention should be paid to the endocrines, and a diet rich in vitamins may be indicated.

Once a few cases exhibiting this condi-

tion have been recognized clinically, it will be found that it is more common than is generally known. Every case of obstinate constipation may well be suspected of presenting one of these anomalies of the colon.

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Reports Effects of Benzene, X-rays, and Radium on Blood Formation.—Radium, X-rays, benzene and its various compounds, such as arsphenamine, are all known to produce injuries to the blood-forming tissues, especially the bone marrow, in certain doses and with certain susceptible persons. On the other hand, these agents are used in the treatment of blood diseases. In a report to the American College of Physicians, Dr. Edwin E. Osgood, M.D., of the University of Oregon

Medical School, reviewed the effects of these agents and the conditions under which they exert an action upon the blood-forming tissues.

It was stated by Dr. Osgood that serious poisoning from these substances in the industries is not uncommon but might be prevented by periodic blood examinations, elimination of the more susceptible individuals, reduction of exposure by local ventilation in benzene cases, and the use of less toxic substances.—*Science Service.*

A NEW FEATURE IN IODIZED OILS¹

By FREDERICK R. GREENBAUM, D.Sc., CHICAGO

SINCE the introduction of iodized oil in therapy by Sicard and Forestier (1), its usefulness has been established, confirmed, and generally accepted by the medical profession for roentgen diagnosis and iodine medication. Sicard and Forestier produced an iodized poppy seed oil. Other iodized oils which are also available on the market to-day are iodized sesame oil and iodized rapeseed oil. Subsequently, brominated oils were also prepared. In all these halogenated oils, the unsaturated fatty acids of the oil are chemically combined with only one halogen, such as iodine, or bromine.

In 1897, E. Merck, in Darmstadt (2), patented a method for making fats containing small amounts of iodine. In this patent the fact was emphasized that the presence of chlorine caused a darkening of the oil, and decomposition occurred in a very short time. If, however, quantities of the reagents forming iodine and chlorine in amounts below the theoretic one are used, then there were obtained stable oils containing iodine in amounts of 2, 5, 10, or 15 per cent and chlorine in very small amounts. In a patent (3) assigned to Merck and Company in 1909, Seifert points out that, up to that time, the following facts were known:

1. Complete treatment of fats with "chlor-iodine" yields "chloriodine" fats not stable and not suitable for medicinal use.
2. Complete treatment of fats with hydriodic acid or with iodine and reducing agents yields iodine fats not stable and not suitable for medicinal use.
3. Incomplete treatment of fats with chloriodine yields stable chloriodine fats suitable for medicinal use.

4. Incomplete treatment of fats with hydriodic acid or with iodine and reducing agents yields stable iodine fats fit for medicinal use. However, the incomplete treatment yields only fats or oils with a low percentage of iodine and a very low chlorine content.

In 1928 two physicians (4) prepared iodine trichloride by passing chlorine gas over iodine. This they then dissolved in water and shook it with corn oil. This oil was used for their sinus work. They did not mention the iodine content of the oil nor were they aware of the fact that the chlorine was most probably also combined chemically with the oil.

THE NEW FEATURE IN IODIZED OILS

This was the status of the attempts to prepare fatty oil containing both chlorine and iodine when the problem was taken up in our research laboratories in 1929. In selecting the oil for our study, we were guided by a high iodine value, low specific gravity, low content of the free fatty acids. We also considered (5) that the unsaturated fatty acids, especially linoleic acid, of the oil are highly responsible for the irritating action of iodized oils. Poppy seed oil contains about 65 per cent of linoleic acid, while peanut oil contains only from 21.6 to 24.7 per cent. From these considerations we finally decided to use peanut oil. Peanut oil, called *Oleum Arachis*, also, is composed chemically of the glyceryl esters of the following fatty acids: oleic, linoleic, palmitic, stearic, and arachidic. In addition, peanut oil contains in small amounts high melting fatty acids such as the normal eicosanic, docosanic, and tetracosanic acids described by Taylor (6) and Yantzen and Tiedke (7). These last investigators doubt very much the presence of

¹From the G. D. Searle & Co. Research Laboratories.
Read before the Chicago Roentgen Society, April 14, 1932.

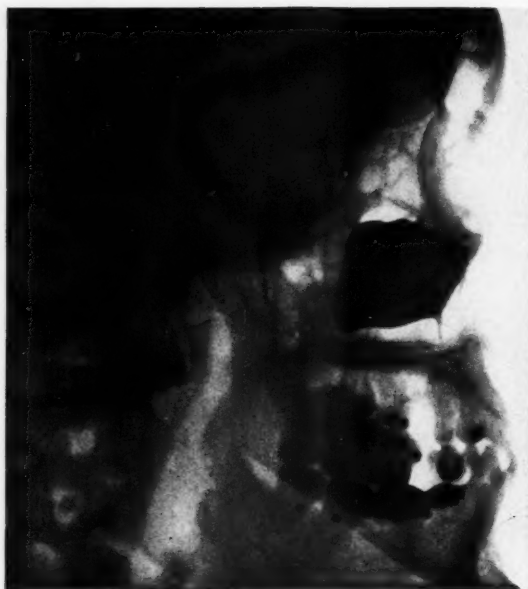


Fig. 1. Study of antrum, iodochlorol injection. (Courtesy George D. Wolf, M.D., New York.)

lignoceric and isobehenic acids in peanut oil. This unique chemical composition is another reason why peanut oil was selected. No other vegetable oil offers such a wide variety of fatty acids as those contained in peanut oil, some of them being entirely specific for peanut oil only.

From a glance at Table II one will notice that peanut oil has a low specific gravity, a fairly high saponification value, and iodine value. The content of the free fatty acids in the native oils is very low. These physical properties make peanut oil a very suitable vegetable oil for the purpose of making halogenated oils.

We succeeded in introducing iodine and chlorine in peanut oil in such a fashion that the oil was saturated with halogens accord-

ing to the iodine number of peanut oil. One important feature in the manufacture of this halogenated oil is the fact that the free fatty acids are removed before and after halogenation, which removes the irritating properties and also affords remarkable stability to the halogenated oil.

This iodized and chlorinated oil, which is otherwise known as iodo-chlorol, contains about 27.5 per cent of iodine and 7.5 per cent of chlorine, so that the total content of halogen amounted to about 35 per cent. The action of chlorine and iodine is complementary and whether or not this results in a better shadow than produced by an oil containing iodine alone remains to be established. The halogenated oil so obtained has a brilliant yellow color, a specific gravity of 1.290 at 15.5° C., and a relative viscosity of 103, while the original peanut oil has a relative viscosity of 5.24.

ESTERS OF THIS HALOGENATED OIL

For many purposes, in fact for most purposes, this high viscosity of the halogenated oil is very desirable, but for some purposes, as in urologic work, a very low viscosity is desired. To accomplish this, we prepared the ethyl esters of peanut oil by esterifying the peanut oil with ethyl alcohol, introducing iodine and chlorine, which resulted in the formation of iodized and chlorinated esters of peanut oil, containing about 25 per cent of iodine and 7 per cent of chlorine. These esters are much more limpid than the oil, having a viscosity of 4.24, a specific

TABLE I.—FATTY ACID CONTENT OF TWO KINDS OF PEANUT OIL

Oils from	Oleic acid per cent	Linoleic acid per cent	Palmitic acid per cent	Stearic acid per cent	Arachidic acid per cent
Spanish nuts	52.1	24.7	8.2	6.2	4.0
Virginia nuts	60.6	21.6	6.3	4.9	3.3

TABLE II.—PHYSICAL CONTENTS OF PEANUT OILS

	Oil from Vir- ginia nuts	Oil from Spanish nuts	Oil from African nuts	Commercial oil
Specific gravity at 15° C.	0.917	0.9175	0.911	0.9209
Saponification value	192.5	190.68	194.0	192.1
Iodine value	91.75	94.17	85.6	98.4
Hehner value	94.87	95.31		
Free fatty acids, as oleic acid	0.55	0.79	0.62	6.2
Cold test	+3°	+3°	+2°	+10°
Melting point of fatty acids	29°	34°	30°	28°
Solidifying point	27.5°	32.5°	29.0°	25°

TABLE III.—VARIOUS CONSTANTS OF VEGETABLE OILS AND THEIR HALOGENATED PRODUCTS

Name of oil	Specific gravity at 15.5° C.	Relative viscosity*	Iodine number	Saponification number	Acid value
Peanut oil	0.917 - 0.9209	5.24	83 - 103	189 - 196	0.5 - 5.0
Iodochlorol (iodized and chlorinated pea- nut oil)	1.290	103.01			
Iodized ethyl esters of peanut oil	1.21	4.24			
Rapeseed oil	0.9133 - 0.9168		94 - 106	167.7 - 179	1.4 - 13.2
Iodized rapeseed oil	1.289	30.21			
Poppy seed oil	0.9255 - 0.9268		132.6 - 136	190.1 - 197	0.7 - 11.0
Iodized poppy seed oil 40 per cent	1.340 - 1.350 at 20° C.	63.17			
Sesame oil	0.9203 - 0.9237		103 - 115	188 - 197	0.23
Iodized sesame oil 40 per cent	1.370 - 1.372				
Olive oil	0.9150 - 0.9180		75 - 88	185 - 196	1.9 - 50.0
Brominized olive oil 33 per cent	1.16	3.77			

*The term "relative viscosity" used here was taken to be $\frac{\text{time} \times \text{density (oil)}}{\text{time} \times \text{density (water)}}$

gravity of 1.21, and are stable to light and heat.

Table III shows the various physical properties of some vegetable oils and their halogenated products.

From this table it is seen that iodized and chlorinated peanut oil has the highest relative viscosity of all halogenated oils, while the iodized and chlorinated esters of peanut oil have, with the exception of brominized olive oil, the lowest viscosity. Even the iodized and chlorinated peanut oil is suffi-

ciently heat stable to be sterilized by pasteurization.

TOXICITY

Iodized and chlorinated peanut oil is non-irritating due to the fact that the iodine and the chlorine are firmly held in organic combination. The chlorine is just as firmly combined chemically as the iodine, so that no possible irritation could occur due to the presence of chlorine. The halogenated oil is also non-irritating due to the fact that the



Fig. 2. Study of antrum, iodochlorol injection. (Courtesy Millard F. Arbuckle, M.D., St. Louis.)



Fig. 3. Monolateral bronchiectasis, iodochlorol by passive aspiration. (Courtesy Hugo O. Deuss, M.D., Chicago.)

peanut oil is highly refined before and after it is subjected to iodization and chlorination. It is, as has been established by animal experiments in our laboratories, of low toxicity and, therefore, well tolerated in large amounts. The esters of this halogenated peanut oil are likewise non-irritating and of low toxicity.

USES OF IODIZED OILS

In iodine medication, in cases in which large amounts of iodine are indicated, iodized and chlorinated peanut oil may be given in large doses, one to two teaspoonfuls, without producing any ill effects, such as iodism, etc. Iodized oils produce in general the same systemic effects as ordinary iodides, but their iodine is more slowly absorbed and excreted and they are more persistently retained in the tissues, especially in tissues rich in lipoids. The iodized oils generally pass the stomach unchanged and are saponified and absorbed in the small intestine. They are then deposited for the most part in lipid tissues, in which they are gradually oxidized, yielding inorganic iodide, which is given off to the blood.

When a gradual long-sustained iodide action is desired, iodized oils have therapeutic advantages over ordinary iodides. Larger doses may be given than is the case in inorganic iodides without producing iodism.

In sinuses, recent investigators highly recommend the use of iodized oils for diagnosis (8, 9), pointing out that they can be injected into the various sinuses without harmful effects. Iodized peanut oil is particularly suitable in this field, because its viscosity is high and does not have to be diluted with heavy petrolatum or olive oil as is the case with other iodized oils.

Wolf (10) praises iodized oil for the study of antra and recommends its use in large institutions as a routine procedure. In the usual displacement technic, Proetz (11) obtained very satisfactory results by the use of iodized oil.

In our own researches with our iodized and chlorinated peanut oil (iodochlorol) in sinuses, X-ray plates of deep shadow, clearness, and sharpness were obtained, unexcelled by those obtained with any other contrast medium.

Figures 1 and 2 are illustrations of the study of antra by means of our iodized and chlorinated peanut oil.

In *bronchography* through the use of iodized oils, considerable progress has been made within recent years. The non-irritating properties of iodo-chlorol make it well adapted for this use. Wood (12) recommended the oral administration of iodized oil as an aid to the differential diagnosis of upper lobe bronchiectasis and pulmonary tuberculosis.

After several injections of iodized oil by aspiration into the lungs, Singer (13) reports satisfactory results in a case of streptothricosis. Stiehm (14) gives complete credit to the insufflation of iodized oil for successful treatment of bronchiectasis. Hygienic living, postural drainage, rest, and the systemic effect from the iodine content of the iodized oil are all possible factors. Case histories show that patients treated with iodized oils do better than those without this treatment. Eschbach (15) reports on a pulmonary gangrene cured by tracheal injection of iodized oil. Surgical intervention in such cases is difficult and dangerous. Eschbach recommends the use of iodized oil before operation is performed. According to Iglauer (16), endo-

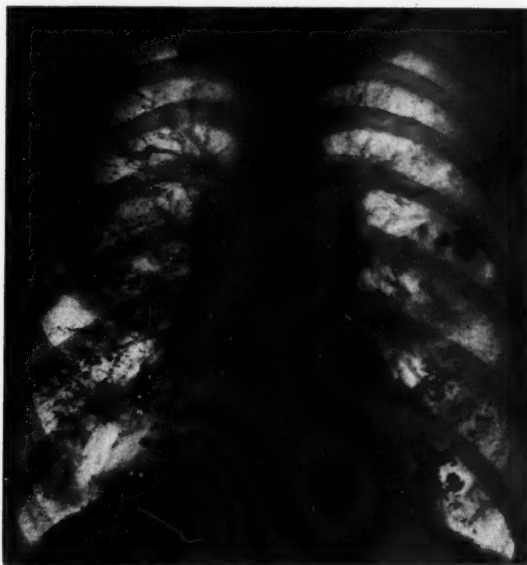


Fig. 4. Study of bilateral bronchiectasis, iodo-chlorol by passive aspiration. (Courtesy Hugo O. Deuss, M.D., Chicago.)



Fig. 5. Exploration of fallopian tubes, iodo-chlorol injection. (Courtesy Robert A. Arens, M.D., Chicago.)



Fig. 6. Normal retrograde pyelogram, iodochlorol emulsion. (Courtesy Earl Ewert, M.D., Chicago.)

bronchial injection is well borne by the patient, no disturbing effects being encountered. He recommends slow injection with the use of a special intubation instrument. Injection of the oil is contra-indicated in febrile or cachectic patients and in those with cardiac decompensation. Expectoration is usually increased for a few days after the introduction of the oil, a considerable portion being thus ejected. The remainder is eliminated by absorption.

Singer (17) describes the introduction of the iodized oil into the lungs by pulling the tongue out as far as possible and introducing the iodized oil with a straight cannula and a 20 c.c. syringe. Perfect films of the bronchiectatic cavities of the lungs were obtained in 25 cases. Archibald (18) pointed out the fact that iodized oils are contra-indicated in cases of tuberculosis and infections of the upper respiratory tract. In an

interesting study, Pinkerton (19) pointed out that iodized vegetable oils do not produce any reaction and do not appear to injure the lungs in any way. Their removal from the lungs seems to be accomplished entirely by expectoration. *Free fatty acids* in the oil produce necrosis in the lung tissue. The degree of drainage and resulting fibrosis produced by an oil in the lungs depends largely on the amount of free fatty acids originally present and on the rapidity with which hydrolysis progresses. The almost complete lack of reaction to neutral vegetable oil in the lung is probably due to the absence of enzymes capable of hydrolysing the oil.

A unique study was made by Zalewski (20), who used Finikoff's method to increase the defensive mechanism of the organism by stimulating the lipolytic and the proteolytic power of the blood. This was accomplished by intramuscular injections of iodized oil and by the peroral administration of calcium salts. Zalewski reported excellent and lasting results with this method in osteo-articular tuberculosis, tuberculosis of the epididymis, and lymph node tuberculosis.

Faulkner (21) studied the uses of iodized oil in pulmonary suppuration and found that intrabroncheal injections of iodized oils permit a study of "internal drainage." Internal drainage is the spilling of pus from a diseased bronchus to the neighboring bronchi of either lung.

Soresi (22) has facilitated greatly the use of iodized oil for intratracheal injection by working out a simplified technic. He injects the iodized oil through a syringe (the oil being kept lukewarm), inserting the syringe into a special cannula tongue depressor. He anesthetizes the organs thoroughly, which avoids dripping of oil into the esophagus even if the patient moves the head.

In our own investigations, we have found iodized and chlorinated peanut oil (iodochlorol) very suitable for the study of monolateral and bilateral bronchiectasis, particularly if three parts of iodochlorol are mixed with one part of the iodized and chlorinated ethyl esters of peanut oil. The results obtained are shown in Figures 3 and 4.

In gynecology, considerable work has recently been done on the exploration of the fallopian tubes and the uterus for sterility investigation. The leading researches of Stein and Arens (23) have opened this field, making it accessible to almost every obstetrician and gynecologist. They devised a new radiographic table for pelvic radiography with iodized oil and pneumoperitoneum, combined the method of pneumoperitoneum with the one of iodized oil instillation (24) and obtained very satisfactory results. According to Rubin and Bendick (25), iodized oils should not be injected into the uterus without first proving, by per-uterine carbon dioxide gas insufflation, that the fallopian tubes are definitely non-patent. Witwer, Cushman, and Leucutia (26) assert that hysterosalpingography by means of iodized oil is a safe and simple procedure. In a series of 152 cases, the authors observed only one accident, that of a ruptured tube which did not lead to any ill effects. The method is of great diagnostic value in developmental anomalies of the genital organs, in tubal conditions leading to sterility, in certain carefully selected cases of pregnancy, and in uterine tumors. The method is contra-indicated in recent hemorrhagic inflammatory conditions that are not completely quiescent, active infections or malignant growths involving the cervix, previous intra-uterine intervention, uterine gestation in which a therapeutic abortion is not desired, infected cervical or uterine polyps, and fever. In certain instances, the injection of iodized oil is of direct therapeutic value.

Lash (27) successfully used iodized oil in

cases of uterus bicornis, bilateral salpingitis, and pelvic peritonitis. The function of the tubes was not disturbed by the iodized oil as the patient delivered a full-term child one year after injection. Lash, however, believes that, in the presence of infections in the female generative tract, the use of iodized oils is contra-indicated, as they have no antiseptic properties.

That our own studies have given very satisfactory results with iodochlorol for the exploration of the fallopian tubes can be seen from Figure 5, obtained with our iodochlorol.

USE OF IODIZED AND CHLORINATED ESTERS OF PEANUT OIL

While intravenous pyelography has certain theoretic values, in actual practice the main reliance is still based upon retrograde pyelograms. A good pyelographic medium must have the following properties to be of service to urologists:

1. It should give a good shadow.
2. It should have a low viscosity and should be miscible with water in all proportions.
3. It should be of low toxicity and free from all irritation.

Our research laboratories have succeeded in developing such a medium, called iodochlorol emulsion (Searle). The active ingredient in this emulsion is the iodized and chlorinated ethyl esters of peanut oil, containing about 25 per cent of iodine and about 7 per cent of chlorine. It has a specific gravity of from 1.19 to 1.22 at 25° Centigrade. It has a relative viscosity of 4.2. This extremely low viscosity makes the iodized esters very suitable for pyelographic work, as the emulsion has a still lower viscosity. The iodized ethyl esters of peanut oil are mixed with a small amount of mineral oil and emulsified with 10 per cent potassium oleate. The emulsion also contains 0.5 per cent benzyl alcohol.

The use of iodized oil in emulsion form was first studied by Neuswanger (28, 29), who, as early as 1926, reported favorably on its use as a pyelographic medium. Langer (30), in Germany, obtained excellent pyelograms by the use of emulsified iodized oil. No evidence of irritation or other injurious complications were obtained and it was borne without reaction of any kind. Behrenroth (31) used the iodized oil in non-emulsified form and, while he at first reported favorable results, he encountered difficulties because he used the oil as such and not in emulsified water-miscible form.

In our own researches we found that the iodochlorol emulsion gave excellent pyelograms of great density and sharpness. The emulsion was well tolerated and no irritation or reactions of any kind were obtained. The emulsion was readily eliminated a few hours after the injection into the catheter. Pyelograms were obtained with this iodochlorol emulsion, Figure 6 being typical of all of them.

ACKNOWLEDGMENT

The author is greatly indebted to the many helpful suggestions and advice of P. A. Kober, Ph.D., Director of the Research Laboratories of G. D. Searle and Company. He also wishes to thank all the physicians who so kindly co-operated with him in this study.

SUMMARY

1. A new iodized peanut oil, containing approximately 27.5 per cent of iodine and 7.5 per cent of chlorine, and ethyl esters of the oil have been described.

2. Besides the high radiopacity due to the presence of two halogens, they possess the following properties:

(A) In sinus diagnosis, the high viscosity of the oil is an advantage.

(B) In bronchography, the non-irritating qualities of this oil and the viscosity, made controllable by adding the esters to the oil, make it particularly valuable.

(C) In gynecology, in recent studies of the exploration of the fallopian tubes, it has been found suitable.

(D) In pyelography, an emulsion of the esters was shown to have ideal properties for retrograde pyelograms.

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Viosterol Found Beneficial to Radium-poisoning Victims.—Almost simultaneously with the news of the twentieth death from radium poisoning among the unfortunate watch factory workers, comes the announcement of a promising method of treating the condition. Viosterol, now often given children in place of cod liver oil to prevent or cure rickets, has benefited a number of victims of radium poisoning, Dr. Frederick B. Flinn, of Columbia University, has reported to the American Medical Association. Dr. Flinn does not consider that he has a cure for the condition, but merely reports a method of treatment that has given promising results.

"Our experience so far suggests a method of treatment that will eliminate radium salts from the organism as well as improve the condition of the bones if continued for sufficient time," he stated. "It is a matter of months and not days. Care should be taken that fresh preparations are used," he cautioned.

Most conspicuous among radium-poisoning victims were the dial painters in the watch factory who used to put their radium-paint brushes in their mouths to point them. In this way radium entered their bodies and in about one-fifth of the cases the radium was deposited in the bones instead of being eliminated. While the amounts of radium ab-

sorbed in this way were small, the activity of radium is so great that these small amounts were sufficient to destroy bones and tissues and to cause fatal illness.

How to get the radium out of the body before it had caused irreparable destruction was the problem which Dr. Flinn and other scientists attempted to solve. Because radium is related to calcium, it was supposed that any treatment that would affect calcium might have a similar action on the radium deposits, Dr. Flinn explained. So he first tried treatment with an extract of the parathyroid glands, because these glands are thought to regulate the calcium of the body. Parathyroid treatment had been moderately successful, when Dr. Flinn suggested the use of viosterol. Vitamin D, calcium utilization in the body, bone formation, and the parathyroid glands are all linked together, so viosterol, which is a potent source of Vitamin D, was a logical selection.

The results of this treatment in eight cases have been good. In two cases, radium was completely eliminated from the body; in the other six, the amount of radium was materially reduced. Improvement in general health, such as freedom from pain, gain in weight, and improved condition of the blood, followed the treatment. In most of the patients the destruction of bone was checked.—*Science Service.*

TREATMENT OF MASTOIDITIS WITH X-RAYS¹

By WILLIAM L. ROSS, M.D., OMAHA, NEBRASKA

DURING the past 17 years, I have treated 41 cases of mastoiditis with X-rays. Of these, 16 acute cases were seen in children. Of the adults, 15 were acute, seven subacute, and three chronic.

The chief complaints in all were pain, tenderness to pressure over the mastoid, and discharge from the ear. The pain was generally of a deep, boring character, quite constant, accompanied at times by sharp, shooting pains. These symptoms were generally preceded by an acute cold in the head, sore throat, and earache. Tenderness to pressure was generally more marked over the antrum and tip of the mastoid; but, at times, it was felt over the entire mastoid. Discharge from the ear varied from a thin, serous to a rather thick, creamy exudate.

All of the 16 children suffering from acute mastoiditis felt more or less relief from pain in the middle ear upon spontaneous rupture or paracentesis of the tympanic membrane. But pain in the mastoid continued and the discharge from the ear, in most cases, was quite profuse, indicating mastoiditis.

Chief complaints in all adult cases were a constant, deep-seated, dull pain accompanied at times by sharp, shooting pain. Also, most cases complained of a swishing sound that corresponded with the heart beat. All had marked tenderness to pressure over one or more areas of the mastoid.

Symptoms.—The temperature varied from subnormal to 103° Fahrenheit. All exhibited increased pulse beat, and more or less malaise, etc. Previously, 10 of the patients had been diagnosed by one or more

doctors as presenting acute mastoiditis and been advised to be operated on at once.

Of the seven cases of subacute mastoiditis, all gave a history of having had an acute attack of more or less severity from two to four months previous to examination. All complained of a deep-seated pain which varied in severity but was more or less constant. All complained of noises in the ear, and some heard the swishing sound, corresponding with the heart beat. All had tenderness to pressure over some part of the mastoid. Some had discharge from the ear. In all the hearing was impaired to varying extents. Some had a subnormal temperature and some a slight rise in temperature at some time during each 24 hours.

Of the three cases of chronic mastoiditis, all had had acute mastoiditis from four to six months previous to examination. All had complained of some pain and tenderness to deep pressure over the mastoid. Some had discharge from the ear. In all, the hearing was pronouncedly impaired.

Diagnosis.—In all cases, the diagnosis was made from the character and location of the pain, the degree of tenderness to superficial or deep pressure, and the quantity, rather than the character, of the discharge from the ear.

The extent of mastoid cells involved, the amount of exudate, and the destruction of the trabeculae were judged by a study of X-ray films of the normal and diseased mastoids. No attempt was made to differentiate the borderline medical or surgical cases.

All the foregoing cases were treated with X-rays. The technic, number of treatments, and length of time during which treatment was given were varied to suit the case.

¹Read before the Radiological Society of North America, at the Seventeenth Annual Meeting, at St. Louis, Nov. 30-Dec. 4, 1931.

In all acute cases, roentgen treatments were given every 8 to 12 hours until pain was stopped, which usually occurred after from three to five treatments were given. Relief of tenderness usually required from five to seven more treatments. The discharge in most acute cases increased in quantity for from two to four days, when it began to lessen rapidly.

The average number of treatments in acute cases was from seven to 12. Most cases were dismissed in from five to 10 days. The subacute and chronic cases required a greater number of treatments over a longer period of time.

Technic.—80 K.V.; 5 ma.; filter, 5 mm. Al and 2 inches of felt next to the skin area treated; cone, 3-inch; target distance, 13 inches; time, from 6 to 7 minutes; dosage, from 30 to 35 ma.-minutes.

SUMMARY

Some of the advantages of roentgenotherapy of mastoiditis are:

- (1) Treatment at once stops further invasion and destruction of mastoid cells.
- (2) Pain begins to lessen, following the first treatment.
- (3) The discharge is thinned and increased; when all pain and tenderness are relieved, the drainage stops.
- (4) No diseased areas of the mastoid cells are missed as the treatment covers the entire mastoid.
- (5) The treatment is painless.
- (6) The course of the disease is shortened.
- (7) The danger and pain attending surgical operation are avoided.

Some of the disadvantages are:

- (1) Temporary loss of hair over the area exposed to X-rays. The hair, however, comes in thicker than before in about three months.
- (2) Dermatitis of the area exposed to

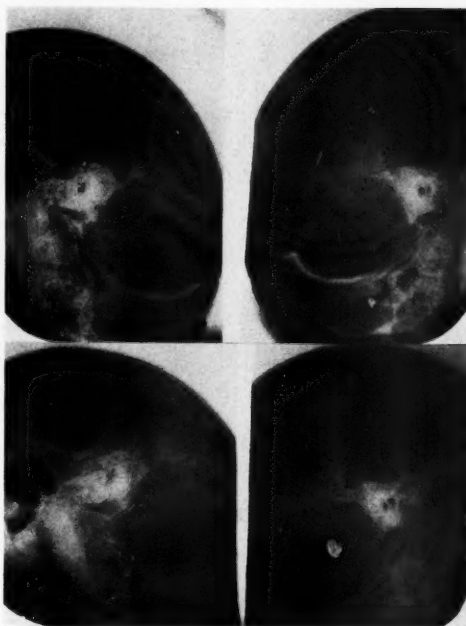


Fig. 1-A (*upper*). Case 11. The film was made five days after the onset of the disease. While the left mastoid is clear, the right mastoid shows marked cloudiness of the cells of the antrum. Antral cells are filled with exudate and cell walls are faintly outlined. A condition of acute purulent mastoiditis prevails in the antral cells. The anterior wall of the sigmoid sinus is quite well outlined, which is corroborative evidence of purulent mastoiditis. Cells in the tip of the mastoid are not clouded. The cells posterior to the sigmoid sinus are definitely hazy, but the cell walls are not destroyed, indicating simple mastoiditis in this area. The superior cells of the mastoid are markedly cloudy and the cell walls are not visible, indicating acute purulent mastoiditis in this area.

Fig. 1-B (*lower*). The same case, the film having been made 13 days after Figure 1-A. Cloudiness of some of the antral cells is less pronounced. The anterior wall of the sigmoid sinus is not so definitely pronounced. Cells posterior to the sigmoid sinus are less hazy, and trabecular walls are more definitely outlined. Cells of the superior mastoid area are noticeably less hazy. The condition of all the mastoid cells shown definitely demonstrates that no further invasion or destruction of trabeculae occurred after roentgenotherapy was begun.

X-rays, which, however, can be prevented by proper filtration, the application of salted butter once a day over the exposed area, and the application of a very mild high frequency current of electricity through a vacuum electrode.

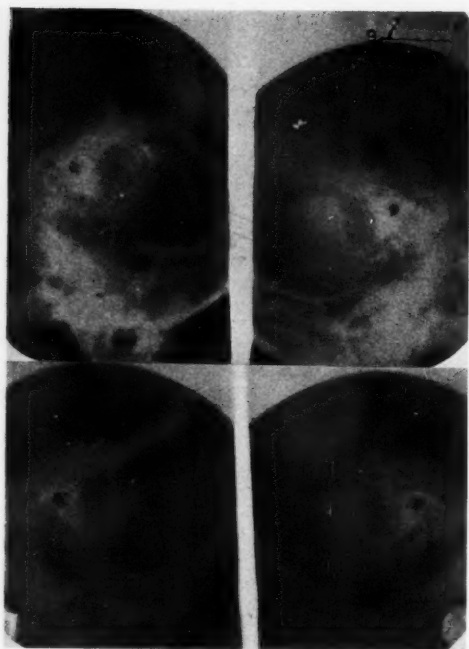


Fig. 2-A (upper). Case 13. The film was made three months and 24 days after the onset of the disease. The right mastoid, though not complained of, is small and the cells are poorly outlined. It is not normal. The left mastoid shows marked cloudiness in the cells of the antrum. The tip of the mastoid is slightly hazy. The anterior wall of the sigmoid sinus is clearly outlined. In fact the whole lumen of the lateral and of the sigmoid sinus are quite well outlined. The cell walls overlying the sigmoid sinus are quite irregular in outline and for the most part have been destroyed and absorbed. The sinus itself is not infected. The cells posterior to the sigmoid canal are definitely filled with exudate and cell walls are destroyed. The whole picture is that of subacute, purulent mastoiditis.

Fig. 2-B (lower). The same, made one month subsequent to the film above. The antral area and the area posterior to the sigmoid sinus are definitely less cloudy and show signs of absorption of the exudate. The posterior canal wall is clearly seen, the superior cells of the antrum, though small, show signs of clearing up.

CASE REPORTS

Case 1. May 3, 1914, Alice D., age 8 years. The patient had been suffering for seven days with severe pain, which began in the middle ear, spreading, in two days, to the mastoid. On the third day of the pain in the middle ear, spontaneous rupture of the tympanic membrane occurred, greatly

relieving the pain in the middle ear. Although the middle ear discharged freely, it did not relieve the pain in the mastoid. Examination revealed a marked localized swelling over the mastoid. I made a diagnosis of acute mastoiditis with subperiosteal abscess and advised mastoidotomy.

The child's aunt objected to operation and asked me to try roentgenotherapy to relieve the pain. This I promised to do, if I were permitted to lance the subperiosteal abscess which had perforated the cortex of the mastoid. The abscess was lanced and frequent irrigations of the wound and ear canal were made each day. Since the pain in the mastoid, though somewhat less, continued, I gave X-ray treatments on five consecutive days. Following each treatment the pain was noticeably less, and by the fifth day had stopped. The drainage from the wound and middle ear, although much lessened, continued. On the fifteenth day, the discharge from the middle ear had ceased and the external wound was healed. I gave one more X-ray treatment and dismissed the patient. No X-ray films were made of this case.

Case 11. April 24, 1924, L. N., aged 8 years. The chief complaint was pain in right mastoid. On April 19, the patient began suffering quite suddenly with severe pain in her right ear. Two days later, pain commenced behind her ear. Paracentesis was done on the second day, greatly relieving the pain in her middle ear but the pain in her mastoid was more marked and continuous with exacerbation. On the third day her physician asked for consultation.

On April 23, a general surgeon and an eye, ear, nose, and throat specialist were consulted. All diagnosed acute mastoiditis and advised immediate operation.

The child's personal medical history was negative except that, during the year preceding examination, she had suffered three attacks of earache, of short duration. She

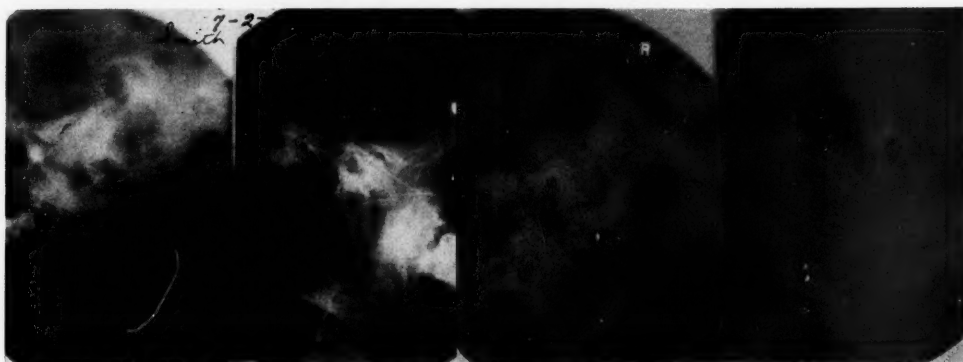


Fig. 3. Case 31. The film was made two months after the onset of disease. The right mastoid is rather small but of a pronounced pneumatic type. The anterior wall of the sinus is shown extending through the mastoid and below the tip of the mastoid. All the cells of the left mastoid are markedly cloudy. The anterior wall of the sigmoid sinus is faintly outlined. Posterior to the sigmoid sinus is a large area with varying densities of shadow, surrounded by a fairly well marked border. This area is evidently an abscess cavity, which drained into the soft tissues of the neck through a perforation of the cortex at the tip of the mastoid.

Fig. 4. Case 39. The film was made about two years after the onset of mastoiditis. The left mastoid is clear with rather large pneumatic cells. The right mastoid shows marked cloudiness of the tip of the mastoid, some cloudiness of antral cells, quite marked cloudiness of a small area of superior mastoid cells, marked haziness of cells just superior to the mandibular fossa of the temporal bone, and marked cloudiness in the posterior border cells of the mastoid. This shows a wide distribution of infection of the mastoid cells with a fairly clear area of cells just anterior and posterior to the sigmoid sinus.

had had whooping cough and chicken pox. She had had measles in January, 1924.

Physical examination revealed swelling over the right mastoid. The tympanic membrane had a small opening in it and there was quite a discharge from the ear. The area over the antrum of the mastoid was tender to pressure but the tip of the mastoid was not.

The patient, who had come in from an automobile trip of 150 miles, looked sick and tired.

Temperature, 101° ; respirations, 40; pulse, 120.

X-ray films showed a cloudiness of the cells in the antrum of the mastoid on the right as compared to the left.

On April 24, at 5 p. m., the patient was given an X-ray treatment over the right mastoid and that night she had less pain. On April 25 and 26, she was given two treatments each day. The pain was noticeably less following each treatment. On April 27, at 9:00 a. m., the child was free

from pain. She had slept well the preceding night. On April 27, 28, 29, and 30 she was given one treatment each day, a total of nine treatments. After April 30 no more X-ray treatments were given.

On May 2, all discharge from her ear had stopped and she felt no tenderness to deep pressure over the mastoid. She was dismissed as cured. An X-ray film was taken on May 7 which showed that infection did not extend after X-ray treatments were begun.

Case 13. July 11, 1924, G. J., age 28 years. The patient's chief complaint was of some mastoid trouble and discharge from the left ear. The patient had just come from consulting a physician who had been treating him for some time for mastoiditis and had repeatedly advised mastoid operation. G. J. came to me, he said, for treatment rather than examination and diagnosis, but I took a brief history of the present illness.

The patient had had acute mastoiditis

March 20, 1924, the pain commencing suddenly in his left ear, following a head cold and sore throat. The ear discharged constantly from the latter part of March and he had experienced pain and tenderness over the left mastoid all the while. At the time of examination, the tenderness was more marked than common.

Physical examination revealed his temperature to be 100°, pulse 100, respirations 20. Localized swelling over the mastoid was marked and tenderness too acute to permit pressure examination. The blood count on July 11 showed red cells, 5,880,000; white cells, 14,400.

Films of the mastoid showed cloudiness and filling of the cells of the left mastoid anterior to, and overlying, the sigmoid sinus, also cloudiness of the tip of the mastoid, contrasting markedly with the cells of the right mastoid, which was not normal.

The diagnosis was exacerbation of subacute mastoiditis.

On July 12, he returned for treatment, receiving 12 X-ray treatments during a period of 14 days. The pain was less following each treatment and by the fourth day had stopped, but the discharge from his ear had increased.

On July 17 the white cell count was 8,400, a reduction of 6,000 white cells in six days.

Fourteen days from the beginning of treatment (July 26), he was free from all pain and tenderness over the mastoid, and the discharge had stopped. The patient was dismissed with a request to return on August 12 for X-ray films, which he did. Films made then showed marked clearing of the mastoid cells. On October 12, the patient again returned. He said he had had no further pain or discharge from the left ear and was feeling well.

Case 31. Mrs. W. S., age 23 years. The patient, who was referred July 2, 1928, for X-ray treatment of mastoiditis, had been suffering with varying degrees of pain in

her mastoid since May 1. On June 25, she suffered a very acute exacerbation of mastoiditis and was very ill, having a temperature of 104° F. for several days.

The history of the present illness, together with the physical examination and X-ray films, compelled a diagnosis of von Bezold's abscess. Bezold's abscess, a term used to denote an abscess which has formed below the mastoid process, is caused by a subperiosteal abscess of the tip of the mastoid perforating its cortex and discharging into the soft tissues of the neck. The point of perforation at the tip of the mastoid was clearly shown in the X-ray film (Fig. 3).

X-ray treatments were begun at once and, as usual, noticeable lessening of the pain followed each treatment. During the night of July 5, after five treatments had been given, the patient slept well. By July 13, nine treatments had been given. The pain in the mastoid and discharge from her ear had stopped and the patient was referred again to her physician.

Case 39. Aug. 15, 1929, Mr. G., aged 57 years. Chief complaints were of pain in the right mastoid and ear, in the right side of the face, in the right temporal region, and impairment of hearing.

For two years preceding the present examination, Mr. G. had suffered in varying degrees with a dull, aching pain in his right mastoid. Pain was constant. He also had heard a buzzing, singing noise in the right ear. The pain in his face and temple was not constant, the character varying from dullness to sharpness. All of his pains increased when he had an acute cold.

On physical examination, he was tender to deep pressure over the tip of the mastoid and over the antrum and superior mastoid cells. He was also tender to pressure just superior to the mandibular fossa of the temporal bone. He presented an eroded, red condition of the external ear canal but no discharge from his ear. A smear from

his right ear canal showed occasional pneumococci and waxy material.

X-ray films of the mastoids showed cloudiness of the tip of the right mastoid, of the antrum and superior cells of the mastoid, and of the cells just superior to the mandibular fossa of the temporal bone. X-ray films of the maxillary sinus showed evidence of chronic sinusitis.

X-ray treatment was begun Aug. 27, 1929, and during the succeeding 14 days he was given 10 treatments. In September, 1929, he had less pain in his right mastoid and right temporal region. Tenderness to deep pressure over the mastoid and temporal region was lessened. During September he was given eight treatments; during October, 10 treatments; during November, but one treatment. During December he was given seven treatments, making 36 treatments in all. On January 1, 1930, he was free from pain in his right mastoid and right temporal region. Deep pressure over the mastoid and temporal region did not cause pain. The singing noise in his ear was not constant and was less pronounced. He was then dismissed as cured except for his maxillary sinusitis.

Case 41. Dec. 13, 1930, I. T., aged 10 months. Chief complaints were an abscess behind his left ear, discharge from the ear, and swelling of the left side of the face.

During the night of Nov. 30, 1930, the baby suffered with earache. The following morning his ear began to discharge freely. At the end of one week the discharge was much less and a swelling was noticed just behind the left ear. December 11, twelve days from the onset of otitis media, the attending physician lanced the swelling over the mastoid and a small amount of pus exuded. On December 12 his face began to swell and his left eye was so swollen as to be shut. An eye, ear, nose, and throat specialist was consulted, who advised that the baby be operated on.

Physical examination, made on December 13, revealed a temperature of 100° F., pulse 110, respirations 40. Inspection revealed a marked swelling over the left mastoid. A closed wound was seen about the lower border of the antrum. The swelling extended above and in front of the ear. The left eyelids were badly swollen, and the left side of the face, as well as the lymph nodes of the left side of the neck, were swollen and tender.

Blood count: red blood cells 3,900,000, white cells 20,000, hemoglobin 50, polymorphonuclears 60.

The abscess was lanced and a free discharge of pus followed.

X-ray films showed a cloudiness of the mastoid cells, and also the point of rupture of the abscess through the cortex of the mastoid. The diagnosis was mastoiditis with subperiosteal abscess.

This case is of particular interest in that the condition had clearly passed the medical phase of mastoiditis into that phase demanding surgery and in that we were able to demonstrate mastoid cells in a baby 10 months old.

During the first four days, eight X-ray treatments were given over the mastoid. Following the first treatment, the baby began to rest better. From Dec. 13, 1930, to Jan. 9, 1931, 21 X-ray treatments were given over the mastoid and three treatments over the enlarged lymph nodes of the neck. By Jan. 9, 1931, the wound over the mastoid had healed, the discharge from the ear had stopped, and there was no tenderness to pressure over the mastoid. The case was dismissed as cured.

CONCLUSIONS

1. X-ray treatment is applicable in almost all phases of mastoiditis.
2. Results of X-ray treatment of mastoiditis are satisfactory to the patient and the roentgenologist.

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Insanity a Matter of Colloid Chemistry.—A permanent change in the brain means abnormal thinking, which we call insanity, says Dr. Wilder D. Bancroft, Professor of Chemistry at Cornell University. When we boil an egg, the white coagulates. When we dissolve rubber in benzene, the rubber is dispersed. No such extreme changes take place in the brain, but there are two types of insanity, in one of which the brain is more coagulated than usual and in the other of which it is more dispersed than usual.

If a person is suffering from the coagulation type of insanity, drugs which counteract coagulation will help the patient. This has been done successfully by administering bromides and could probably be done better by the use of thiocyanates. If a person is suffering from the dispersion type of insanity, alleviation will be obtained by giving a drug which will tend to coagulate the brain tissues.

In 1921, Berger gave cocaine to eleven patients suffering from catatonic stupor and found that the majority of them became active immediately after the first injections, though the improvement did not last more than an hour or two. In 1930, Lorenz anesthetized a similar patient with sodium amytal.

All anesthetizations involve coagulation, and the patient passed through a normal state on coming out from the anesthetic and before relapsing into the catatonic stupor. This patient was in an aroused mental state for about four hours, after which she fell into a natural sleep for five hours. Later the symptoms of mutism, muscular rigidity, and active negativism developed slowly.

Dr. Langstrass, of St. Elizabeth's Hospital in Washington, has reported that he has ad-

ministered carbon dioxide and oxygen in suitable proportions to a patient who had suffered from catatonic stupor for ten years. This, coupled with other treatment, has kept the patient in an apparently normal state for nearly two years, a remarkable medical triumph.

Of course, treatments of this sort will not restore brain tissue which has been eaten away by syphilis or anything of that sort, but they will enable the physician to get the coagulated tissue back into a more nearly normal state.

Over-doses of a dispersing agent should give a normal person a dispersion type of insanity, while over-doses of a coagulating agent should give the coagulation type of insanity. Naturally, there are not many data on this point because nobody wishes to make a sane person insane. When treating persons for high blood pressure, it has been found that continued administration of large doses of sodium thiocyanate gave rise to hallucinations of sight and hearing, mania, confusion, and ideas of persecution, singly or in combination. Since the patients recovered in a week after giving up the drug, these were cases of temporary insanity.

The exclusion of oxygen causes unconsciousness due to asphyxiation. When the oxygen is not cut down so much, interesting mental reactions occur. Aviators may become incapacitated temporarily when flying at high altitudes. There is a height for each aviator above which it is not safe for him to go, as he may develop mental confusion, leading to errors of performance; sometimes hallucinations of sight and hearing; and, in some cases, an uncontrollable desire to sing and whistle. This last is rather an anticlimax.—*Science Service.*

RECORDS IN ROENTGEN THERAPY¹

By CARL L. GILLIES, M.D., CEDAR RAPIDS, IOWA

NO absolute, fixed rules can be laid down concerning the keeping of records in roentgen therapy. Whether the practice is hospital, clinic, or office will influence the type and general form, although certain underlying principles and minimum requirements are necessary and applicable to all kinds of practice. The necessity of making complete and accurate records cannot be over-emphasized. To insure their being kept up they should be simple and concise. It is advisable to have the records in the roentgenologist's own handwriting. This avoids the possibility of error in transcription and such an original record is of greater value than a dictated or copied one if it should have to be produced in court. A good record should include the following points:

1. A brief but adequate *clinical history* of the patient, the age, sex, and previous history, the onset and duration of the present illness, all previous medical and surgical treatment, and, in particular, all previous radiation treatment. Each disease presents its own problems and certain phases of the history must be noted as they suggest themselves. Detailed and voluminous notes of former illnesses which obviously have no bearing upon the condition under treatment can well be omitted.

2. The weight of the patient and the *dimensions* by actual measurement. These data are, of course, unnecessary in dermatologic practice or in cases in which the lesion is superficial.

3. The *diagnosis, size, and location* of the lesion. If it is within the body, the distance from the surface, or surfaces, through

which treatment is to be given, must be noted.

4. The *factors* employed in sufficient detail to permit the determination of the quality and intensity of the dose applied to the skin.

These factors are:

- (a) *Kilovolts*
- (b) *Milliamperage*
- (c) *Anode-skin distance*
- (d) *Size of field*
- (e) *Filter material and its thickness*
- (f) *Length of exposure.*

These six factors determine the size of each dose which should be recorded as:

- (g) *The Size of the Dose in Absolute Units.*—The record should show whether the dose in r has been estimated or actually measured.

The kilovoltage and filter determine the quality or hardness which should be noted as:

- (h) *Quality* expressed in terms of the effective wave length or the half value layer.

- (i) The *date* of each treatment is necessary so that the interval between treatments will be known and the loss of effect can be roughly estimated.

It is also necessary that the records show the dose applied to the lesion. This can be determined from the above data. In our own practice we find it satisfactory to record it as:

- (j) *The depth dose percentage* which is assumed to represent the percentage of each skin dose which reaches the depth of the lesion. The proportion of the beam reaching the lesion is read from distribution charts of our various standard technics. Accurate measurements of the patient, an exact localization of the lesion, and reliable distribution charts are all essential in order

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to estimate the sum of the depth doses with a reasonable degree of precision.

5. The degree of *reaction* and date of observation should be noted.

This includes both the local changes and any constitutional symptoms that may develop.

6. The *results* of treatment, both immediate and late, to include follow-up notes at suitable intervals, should also be recorded.

The general form of record used will depend largely upon the type of practice and whether the roentgen record is to become a part of the patient's hospital chart or is to be filed for office reference. In a clinic or hospital practice printed forms the size of

the hospital chart are convenient, separate printed blanks being used for the history, present illness, treatment record, and follow-up notes. Printed anatomical charts may be prepared upon which the location of the lesion can be marked. Filling in such separate blanks and charts is likely to be too cumbersome for the busy general roentgenologist in office practice. A printed card index system is more convenient, one side of the card being ruled vertically to provide spaces for the date of each treatment and the physical factors used. The back of the card is left blank for the history, dimensions of the patient, description and location of the lesion, and progress notes.

Waves of Electrons will Tell of Crystal Structure.—Waves of electrons will soon allow the scientist to obtain a clearer picture of the internal structure of crystals than ever before possible, Dr. C. J. Davisson has predicted to the American Association for the Advancement of Science and the American Physical Society. Very short wave lengths are available in electron waves and this results in greater power to photograph the fine crystal structure of matter. Dr. Davisson is a pioneer in the use of electron waves, since he won international fame a few years ago by proving that electrons act like waves in much the same way as light and X-rays. He has also developed lenses for concentrating the beam of electrons. Since the electron is what may be termed a particle of electricity, his work bridges the previous gap between matter and electricity.

Just as shortening the wave length of light

used in illuminating a microscope allows smaller objects to be seen, use of electrons made visible by their effects on photographic plates allows physicists to study more minute structure in crystalline matter, Dr. Davisson explained. The electron waves are diffracted by crystals and give rise to diffraction patterns which are quite similar to those produced by X-rays. X-ray studies have given much information on matter's structure in the past decade.

The scattering power of atoms is about a million times greater for electron waves than for X-rays. The electron waves will, therefore, give information chiefly regarding the structure of surfaces of crystals, whereas the X-rays give information about the structure of the bodies of crystals. Dr. Davisson also expects that the electron waves will allow the study of layers of gas attached to the surfaces of metal crystals.—*Science Service.*

MEDICO-LEGAL DEPARTMENT

CONTRIBUTIONS¹ by I. S. TROSTLER, M.D., CHICAGO

MENOPAUSE FOLLOWING A SINGLE APPLICATION OF ROENTGEN RAYS TO THE HEAD

A Ridiculously Assumed Conclusion

Rulison vs. Victor X-ray Corporation
(Iowa), 223 N.W.R. 745

The Victor X-ray Corporation, through one Watson, was installing a second-hand roentgen-ray machine in a physician's office, with a view to its sale. To make a demonstration, Watson requested the physician's office secretary and assistant to submit to an exposure from the machine. She did so, and later, claiming to have been injured thereby, brought suit. Judgment was rendered in her favor. The defendant appealed to the Supreme Court of Iowa, but the judgment was affirmed.

In demonstrating the roentgen-ray machine it had installed, the defendant, through its agent Watson, applied the cone to the plaintiff's head and took three films in succession, with brief intervals, at one sitting. The focal point was the occipital lobe of the brain. Some days later the plaintiff began to feel soreness in her head. Subsequently she lost her hair from an area four inches square. She became subject to a chronic condition of sick headaches, referred to in the record as "ophthalmoplegia migraine." The "muscles of accommodation of the pupil" of her right eye ceased to function, and the eyelid was affected. The menopause came on, although the plaintiff was only 36 years old. Watson testified that nothing occurred that would have caused a burn. He estimated the dosage at 580 milliamperes-seconds, concededly a normal dosage that could not result in injury. The testimony on both sides, however, in-

dicated that the loss of hair was the result of a second degree roentgen burn and that it could not have occurred if less than 1,200 milliamperes-seconds had been applied. A technician who saw the demonstration testified that its duration was longer and the distance from the focal point shorter than were indicated by Watson. She testified, too, to the heating of wires, which required an interval of stoppage to cool them and indicated a want of control of the dosage. The defendant contended that there was no evidence of negligence, but the Supreme Court was of opinion that there was enough to take the question to the jury.

The defendant took exception to the refusal of the trial court to withdraw from the jury all evidence concerning the plaintiff's menopause and the impairment of her vision, claiming that there was no evidence to show a causal relation between those conditions, if they existed, and the application of the roentgen rays. The court pointed out, however, that Dr. Heagey, a witness for the plaintiff, testified that the third cranial nerve, which controls substantially all of the muscles of the eye [*sic*], has its origin about the focal point toward which the roentgen rays were directed; that an overdosage of roentgen rays causes a swelling of the blood cells, which results in an obstruction of the circulation and breaks down the small veins, and that any breaking down of the circulatory system necessarily shuts off the blood supply to parts of the body dependent upon it. Dr. Francis W. Heagey (an Omaha internist) testified, too, that although roentgen rays would not be applied to a woman's head for the purpose of producing sterility, yet an excessive dosage of roentgen rays might penetrate to more or less remote parts of the body, and

¹A part of this matter is reprinted by permission from the *Journal of the American Medical Association*.

the position in which the plaintiff was placed for the purpose of demonstrating the roentgen-ray apparatus was such as to permit the roentgen rays to penetrate the abdomen. This testimony, in the judgment of the court, was sufficient to go to the jury for determination as to whether or not the impairment of the plaintiff's vision and the early appearance of her menopause were caused in the manner claimed.

ADMISSIBILITY OF ROENTGENOGRAMS: WHEN
ADMISSION IS NOT PREJUDICIAL

Consolidated Coach Corporation *vs.*
Saunders (Ky.), 17 S.W.R.
(2d) 233

Where there is no testimony to identify roentgenograms introduced in evidence as roentgenograms of the injured parts of the body that they are supposed to represent, they are inadmissible without the testimony of the person who took them. In the present case, however, two roentgenograms were made of the same injured limb. The second roentgenogram, with the exception of some minor particulars, showed the same character of injury as the first roentgenogram, to the admission of which exception was taken. The physician who took the second roentgenogram testified that his experience enabled him to swear that the roentgenogram to which exception was taken was a roentgenogram of the very same limb that was shown in the second roentgenogram, identified by him. According to this witness, the same bones of the human body are differently shaped and constructed in each individual, just as are the faces of such individuals. Moreover, the plaintiff and some of her witnesses testified that the roentgenogram was taken of her limb, that the doctor who took it immediately delivered it to her, and that she preserved it. But if such reasons were not sufficient to remove the objections to the introduction of the roentgenogram to the ad-

mission of which exception was taken, its admission could not be considered prejudicially material, since its only purpose was to prove the extent of the plaintiff's injuries, and the testimony was uncontradicted on that issue and no sort of earnest attack was made on the amount of the judgment.

ROENTGENOTHERAPIST NOT HELD LIABLE
FOR TELANGIECTASIS DUE TO ROENTGEN
RAYS APPLIED FOR TUBERCULOUS
LYMPHADENITIS

Hazen *vs.* Mullen (Dist. of Col.) 32 Fed.R.
(2d) 394

The appellee, Miss Mullen, had tuberculous adenitis of the lymph glands on both sides of the neck, running down to the middle of the clavicle and into the armpits. In the absence of treatment, one physician testified, the usual result would have been the breaking down of the glands and a long continued discharge through open sinuses, or a rupture of the glands into the blood vessels, with general dissemination of tuberculosis and ultimately death. A surgical operation to remove the glands would have required an incision almost from the ear down to the middle of the clavicle, with the complete cleaning out of everything in the neck on both sides, and in addition to that would have required operations on both armpits. Probably the operation would have extended from the armpits to the clavicle, in order to permit the removal of the intervening glands. While in this condition Miss Mullen consulted Dr. Henry H. Hazen and was treated by him by the use of roentgen rays from February, 1920, until November of the same year. One side of the neck was exposed every other week. The result was so complete a cure that a medical witness who examined Miss Mullen in 1925 testified that he could not discover any enlarged glands and would not have known that she ever had any tuberculous glands at any time.

Some time after Miss Mullen's last treat-

ment, however, "the condition known as telangiectasis or X-ray burns," appeared on her neck. Later, in 1923, she consulted a physician in New York concerning that condition, and he gave her two radium treatments for it. Because of the telangiectasis, she sued Dr. Hazen in the Supreme Court of the District of Columbia and obtained a judgment for \$15,000. He thereupon appealed to the Court of Appeals of the District.

Miss Mullen conceded that at the time of her treatment Dr. Hazen possessed the degree of skill and ability possessed by physicians of his own class, in Washington, and that the application of roentgen rays was the recognized treatment for tuberculous glands. The only question, therefore, was whether or not Dr. Hazen was negligent, and of this the Court of Appeals could find no evidence in the record. Dr. Hazen testified that he exercised his best judgment in the light of the skill and ability he possessed, and that whether he could have afforded her greater protection by prolonging the periods between the exposures of the same area was entirely and absolutely a matter of individual judgment. "It was a question," said Dr. Hazen, "based largely upon the condition of plaintiff, and I felt that the chances for the graveyard were very, very good, if the treatment were not pushed and the intervals were not made short." Several physicians, qualified as experts in the use of the roentgen rays, testified that telangiectasis "may follow X-ray treatment notwithstanding the fact that the highest degree of skill and care has been exercised in the giving of such treatment," and that there is no known method by which it can be foretold whether telangiectasis will or will not follow such treatment. These witnesses agreed that the treatments administered by Dr. Hazen, as shown by the record kept by him, were proper and in accordance with the best knowledge and skill possessed

by men engaged in roentgenology in the District of Columbia at that time. As the Court of Appeals could find no evidence from which it could reasonably be concluded that Dr. Hazen did not exercise his best judgment and ability in treating Miss Mullen, or that in his treatment of her he failed to exercise the care and skill ordinarily possessed and exercised by others in the profession, the judgment of the trial court was reversed, with costs, and the cause remanded.

PHYSICIAN EMPLOYED BY PLAINTIFF TO
EXAMINE HIM MAY BE COMPELLED TO
TESTIFY FOR DEFENDANT

*Webb et al. vs. Francis J. Lewald Coal Co.
et al. (Calif.), 297 P.R. 958*

One of the plaintiffs had been examined by a physician, apparently for the purpose of enabling him to testify on behalf of her and her husband in a suit for damages for personal injuries she had sustained. At the trial, however, the plaintiffs did not produce the physician as a witness. The defendants thereupon subpoenaed him. When called to the witness stand, he refused to testify concerning his examination of the plaintiff or his conclusions from it. He contended that after a physician has made an examination for one party to a suit and his conclusions do not support the contentions of that party, and when he therefore has not been produced as a witness by that party, it would be inequitable to compel him to testify in support of the contentions of the adverse party. If it were known that a physician testified under such circumstances, patients would hesitate to come to him for examination and lawyers would hesitate to send their clients to him. The trial court ruled that the witness could not be compelled to testify. Judgment was given for the plaintiffs, and thereupon the defendants appealed to the District Court of Appeal, First District, Division 1, California, assigning as error,

among other things, the refusal of the trial court to compel the physician to testify.

This ruling of the trial court, said the District Court of Appeal, in reversing the judgment of the trial court, constituted reversible error. However commendable from a professional standpoint may have been the objections of the witness, the policy of the law as declared by the California legislature required him to set aside his scruples and to testify concerning the matters that he had learned from his examination of the plaintiff. When the party examined by him brought suit, she impliedly waived her right to have the results of the examination kept secret, for Section 1881, Subdivision 4, of the California Code of Civil Procedure provides:

"A licensed physician or surgeon cannot, without the consent of his patient, be examined in a civil action as to any information acquired in attending the patient, which was necessary to enable him to prescribe or act for the patient; . . . provided, further, that where any person brings an action to recover damages for personal injuries, such action shall be deemed to constitute a consent by the person bringing such action that any physician who has prescribed for or treated said person and whose testimony is material in said action shall testify."

If the ruling of the trial court were correct, said the District Court of Appeal, that the witness could not be compelled to testify unless arrangements were made to compensate him as an expert witness, it would in effect nullify the provision of the law just stated; for then, all a physician need do if he desired to keep off the witness stand would be to demand such compensation for testifying as it would be impracticable for the defendant to pay. That, said the Court, is not the law.

"The authorities, however, all agree that, in the absence of an express contract to pay

a physician for his testimony as an expert, he is only entitled to the statutory fee. The uniform rule seems to be that a physician who has acquired knowledge of a patient or of specific facts in connection with the patient may be called upon to testify to those facts without any compensation other than the ordinary witness receives for attendance upon court. In those States recognizing the right to extra compensation for a physician who testifies as an expert it is uniformly held that, where such testimony is sought to be elicited without requiring any particular investigation on the part of the physician, he is required to testify without extra compensation."—*McClenahan vs. Keyes*, 188 Calif. 574, 583, 206 P.R. 454, 458.

PRIVILEGED COMMUNICATIONS: WAIVER BY OFFERING TESTIMONY OF PHYSICIAN

Travelers' Building and Loan Assn. vs. Hawkins (Ark.), 34 S. W. R. (2d) 474

When a party to an action puts his physician on the stand to prove that the party was incompetent to make a certain contract, he thereby waives his statutory privilege of maintaining the secrecy of communications between him and his physician. The adverse party may thereafter cross-examine the physician.

COMPENSATION OF PHYSICIANS: LIABILITY OF MEMBER OF FAMILY WHO SUMMONS PHYSICIAN

Benton vs. Stadler (Wis.), 234 N.W.R. 739

It is a general proposition supported by many authorities that he who orders a physician to come to his home to treat a member of his family becomes responsible for payment for the physician's services unless he makes it known to the physician that he disavows responsibility.

CASE REPORTS AND NEW DEVICES

X-RAY GENERATOR: A WORKING MODEL

By H. A. TUTTLE, Assistant Director, Educational Department, Westinghouse X-ray Co., LONG ISLAND CITY, N. Y.

The first reaction of a student when beginning the study of X-ray technology is

finds himself confronted by phenomena belonging to several electric circuits which are closely related to one another. The reactions occurring within the valve and X-ray tubes must also be considered. And in addition, the problems of rectification must be understood. To complicate the matter, the

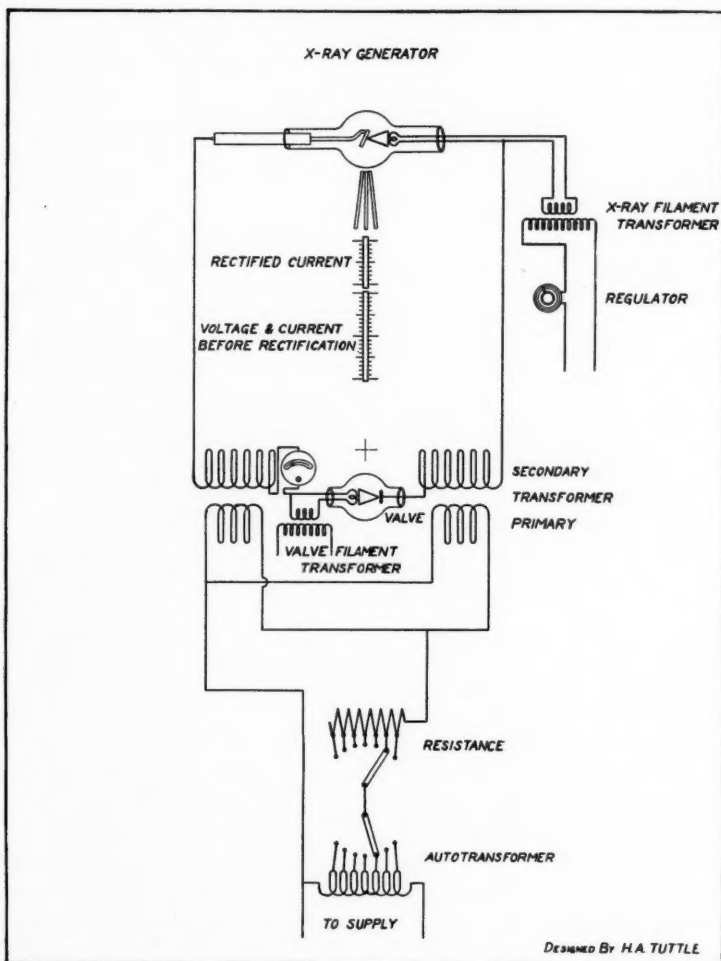


Fig. 1.

usually one of bewilderment. This is especially true when he is brought into contact with the X-ray generator. He immediately

progressive, simultaneous changes occurring in all circuits and parts of the apparatus, must be correlated to one another.

Past experience in instruction proves that charts and mechanical models are of great value to the student. But even with the best of charts, it is difficult, if not impossible, to correctly portray successive continuous changes and to refer the changes in each part of the apparatus to those of every

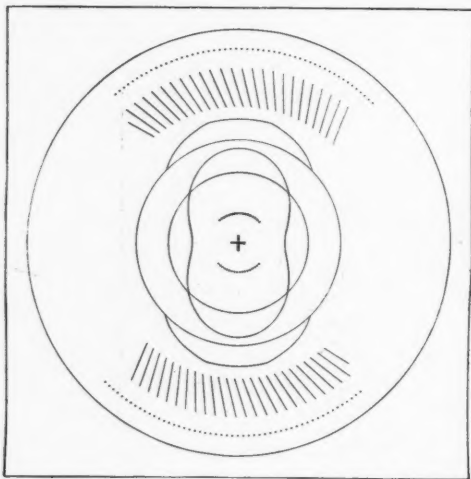


Fig. 2.

other. There is only one type of chart or model that will successfully perform this function, and that is the working model.

The working model developed by the author shows first a complete diagram of all of the important electric circuits of an X-ray generator and tube as connected for operation. With a mechanical rectifier a representation of the rotating and stationary parts is given and the electric connections to them are drawn. The model illustrated was constructed for the single valve rectifier and shows the valve in its place in the circuit.

This model is made in two parts¹ (Figs. 1 and 2). The first, or main chart (Fig. 1), is best made in rectangular form. It carries a complete wiring diagram of all control apparatus, the high tension transformer and rectifier, and the valve and

X-ray tubes. Several slits are cut in this chart, the use of which will be explained later.

The second part (Fig. 2) is made in the form of a circle. It is so mounted, just behind the main chart, that it can revolve easily. Continuous curves of unrectified and rectified voltages are drawn on its surface in circular form. Near the periphery a succession of dots is drawn which represents electrons. Just within the radius of the electrons is drawn a number of oblique lines. These represent X-rays. Near the center two groups of dots are drawn. These represent electrons passing through the valve.

Near the top of Figure 1, the X-ray tube is shown. Note that a triangular section between filament and target is to be cut out. The electrons drawn on Figure 2 are visible here. Three slits are to be cut in Figure 1 just below the tube and radially to the target as a center. These serve as windows to make the X-radiation, which is drawn on Figure 2, visible. Two vertical slits are to be cut just above the center of Figure 1. The upper of these reveals the curve of rectified current, while the lower reveals the sine waves of voltage and current before rectification. A triangular area is also to be cut out of the valve tube as indicated. The electron stream is visible here.

We thus have a working model which indicates the complete circuits, instantaneous values of incoming and rectified voltages, the electron stream of each tube, and the generated radiation. Values of these conditions may be easily compared for any phase angle. Or, if a continuous, moving picture of machine operation is desired, Figure 2 may be slowly revolved in a counter-clockwise direction. The student may then see the rising and falling values of incoming voltage through the slit just above the valve tube, and, through the slit directly above that, the changing values of rectified current. The voltage wave is changed very

¹Figures 1 and 2 are not reduced on the same scale.

little, if at all, by rectification. Electrons may be seen passing from filament to cathode and, simultaneously, the X-rays leaving the tube. The different curves and markings are so laid out that the phase relationships of all are correct. Note that the electron velocity within the valve is much lower than that through the X-ray tube.

A model can also be constructed to demonstrate the action of a mechanical rectifier. A third part is then necessary. This is shaped to portray the rotor of the rectifier and is placed in front of Figure 1 and is centered to Figure 2. A center bearing is then so arranged that Figures 2 and 3 revolve together. The angular position of the rotor is thereby coupled to the proper value of voltage and current.

This model can be made by a draftsman or photographic copies of all parts can be obtained. These can be mounted on cardboard, and assembled with a simple light bearing. The author used a model 3 feet by 4 feet. A smaller size is perhaps preferable, since it can be examined more easily. A size 12 × 15 inches is easy to handle and is large enough to be very understandable.

The last model which was constructed has been used successfully for over a year. All who have seen it have remarked the easy and thorough understanding obtained by a few minutes' observation.

A MOVABLE FLUOROSCOPE FOR FLUOROSCOPY AND SERIAL RADIOGRAPHY WITHOUT THE USE OF A DARK ROOM

By FRANCIS E. TALTY, M.D.,
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In a recent survey of the literature on fluoroscopy made at the Boston Medical Library, Yale Medical Library, and the New York Academy of Medicine, I was amazed to find that little or no attempt has ever been made to do fluoroscopy by any other method

than the dark room. Dr. George C. Johnson (1), of Pittsburgh, in 1905 wrote an article descriptive of a device whereby he allowed a pyramid of rays to emerge from the tube. The fluoroscope consisted of an ordinary fluoroscopic screen set parallel with the line of vision. He made use of a mirror to reflect a shadow on the fluorescent screen, but his device was a hand fluoroscope, and, as such, was necessarily of limited use and fraught with all the dangers of exposure to the direct rays. Lewis Gregory Cole (2), of New York, in 1913 described a table in which he made use of a mirror, a fluorescent screen, and a stationary dark chamber. The table and dark chamber were placed against a lead-lined partition, back of which was placed a cabinet from which the table was operated. In the article descriptive of this table no mention was made of fluoroscopy outside of a dark room or cabinet. In Dr. Cole's device the operator was separated from the patient, which, of course, made it impossible for him to do manual palpation in a gastro-intestinal series, or manual manipulation in case of a fracture. With the Cole table it was necessary to adjust the patient to the screen, rather than the screen to the patient. In other words, Dr. Cole's screen was stationary and could be used only from one fixed point on the table, as the rest of the table was lead-lined beneath.

For several months, I have been using in my office (a well lighted room), a daylight fluoroscopic device which has given me considerable satisfaction. I am not separated from the patient, can palpate while observing the shadow or can allow the surgeon to manipulate a fracture while observing the shadow. The fluoroscopic screen can be adjusted to the patient rather than the patient to the screen, as my device is beneath the table and can be moved lengthwise and crosswise with respect to the table.

While the series of cases in which I have used this device is a comparatively small

one, I feel that it is large enough to justify me in bringing the principle before the roentgenologists. I submit a drawing (Fig. 1) which will clearly bring out the idea, and will describe it in a brief way.

the table and used in connection with a portable X-ray unit, thus making possible a portable fluoroscope for use in homes or wards. The front wall of the chamber, lead-lined, is continued above the table, making a panel

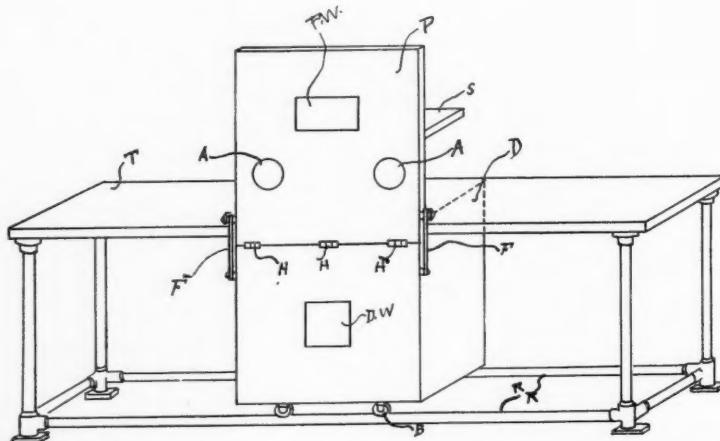


Fig. 1. *T*, table top; *P*, X-ray-proof panel above table; *S*, overhanging shelf for supporting lead curtains; *PW*, panel window through which patient on table may be observed; *A*, openings through which arms of operator are thrust; *F*, fasteners for holding panel in upright position; *H*, hinges to allow panel to fold down; *DW*, dark chamber window for observing shadow in dark chamber closed by lead glass; *D*, dark chamber under table; *R*, longitudinal runs placed on transverse runs (not shown in drawing); *B*, ball bearings. The opening for the insertion of the cassette, which must be of aluminum on both sides, is not shown in this drawing, but is seen in Figure 2 (*C*).

Reduced to its simplest terms, this device consists of a freely movable lead-lined dark chamber, having a fluorescent screen placed on lead glass, backed by a colored plain glass or wood, which excludes all light from the chamber, and serves as a roof for the same. In the bottom of the chamber is placed a mirror which is capable of being tilted to an angle, and this reflects the shadow from the screen. In the side of the cabinet facing the operator is a lead-lined glass window which may be as large as 8×10 for observation of the shadow. This dark chamber is placed beneath a wooden table on runs which allow the chamber to be freely moved lengthwise and crosswise with respect to the table. If desired, the cabinet can be removed from

which when not in use can be turned down. The panel has three openings, the center one closed by a lead glass window for observation of the patient on the table, and one on each side, shut off from the X-ray field by means of a lead curtain, to enable the operator to safely palpate or manipulate the part of the patient under observation.

On the overhanging shelf supporting the curtain may be placed a suitable diaphragm to cut down the amount of X-ray energy striking the screen, or this diaphragm could be placed on the roof of the dark chamber and lead curtains attached to the cone, in this way eliminating the overhanging shelf. The tube in this device is placed above the table, rather than beneath, but could be

placed beneath the table with the dark chamber above the table, if such an arrangement was desired.

I have described the device as used in a horizontal position, but it could also be used

chamber until it strikes the floor. The cassette adjusters are then brought together or to the distance of the width of the cassette to be used, and are then locked by turning thumb screws. On a table to the right of the

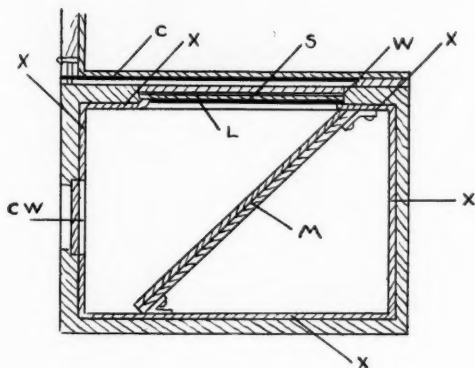


Fig. 2. Side view of dark chamber. *W*, wood or plain colored glass cover over screen; *S*, fluorescent screen; *L*, lead glass on which screen is placed; *M*, mirror (angle at which it is placed can be adjusted); *CW*, lead glass chamber window; *C*, opening to insert cassette; *X*, X-ray-proof lining in chamber.

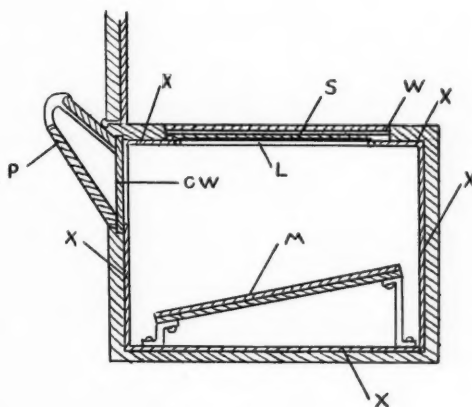


Fig. 3. Side view of dark chamber. *P*, periscope attachment; *M*, mirror (at different angle); cassette opening not shown. Other letters as in Figure 2.

in an upright or angular position by means of counter weights and perpendicular runs.

It is, of course, understood that the dark chamber is connected with the tube stand, so that the tube stand and chamber move in unison. For gastro-intestinal and chest work, a device similar to the one shown in Figure 3 could be attached over the lead glass window. Thus, with the ordinary shades of the room drawn, and the use of a red light, eye accommodation could be obtained to enable one to get more detail.

How serial roentgenography is accomplished in this device is illustrated in Figure 4. Briefly explained, the operator sits in front of the dark chamber and locates the area to be roentgenographed. This localized area is then brought to the right side of the chamber and the latter made stationary by pressing down the stop at the bottom of the

operator are placed the desired number of cassettes, each numbered in the order in which it is to be inserted. With the right hand Cassette No. 1 is inserted between the cassette holders and the exposure is made. No. 2 is next inserted, pushing No. 1 to the left side of the chamber, where it is taken by the operator's left hand, or, if a run has been provided, can slide to the floor.

A freely movable lead-lined dark chamber, having a lead-lined panel, as described, extending above the chamber and the same so positioned that the patient is between the dark chamber and the tube, is, I believe, insofar as I have been able to ascertain, an original idea.

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Idem: An X-ray Table for Serial and Stereoscopic Radiography and Fluoroscopy. Arch. of Roentgen Ray, London, September, 1913, XVIII, 147.

While walking about the beach, he kicked at a fish lying there, cutting the right foot. He consulted a physician and was subsequently hospitalized ten days for treatment of the

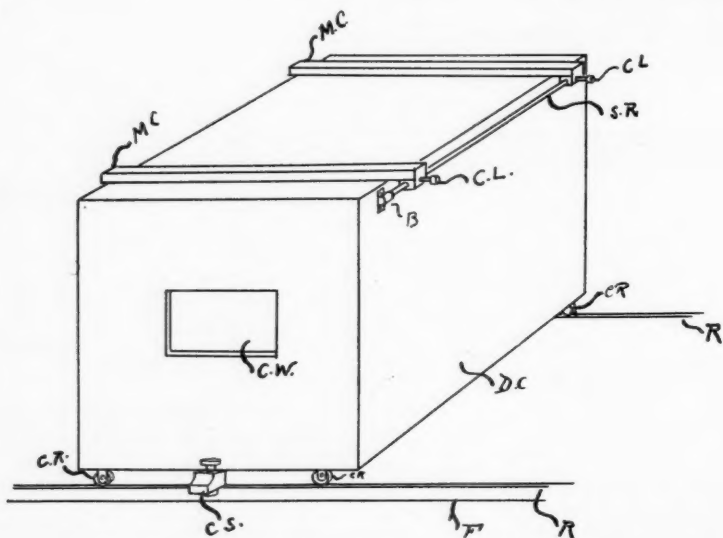


Fig. 4. DC, dark chamber; CW, chamber window; MC, movable cassette adjusters; CL, screw to lock adjusters; SR, stationary run to allow adjusters to slide; B, bracket to hold stationary run (back bracket not shown); R, longitudinal runs for chamber; F, floor of room; CS, chamber stop which strikes floor when pushed down, in manner of door stop; CR, chamber rollers.

THE RADIOGRAPHIC DETECTION OF THE CATFISH SPUR AS A FOREIGN BODY

By W. R. BROOKSHER, JR., A.B., M.D.,
FORT SMITH, ARKANSAS

The recent case report of Taft,¹ in which a catfish spur was demonstrated in the soft tissues of the foot, prompts the report of a similar case, examined by me in 1923. In my case, the bony fragment is of sufficient size to permit of illustration; it is of further interest due to the period the spur remained in the foot without producing symptoms.

A young man, engaged in spring baseball training at Bradentown, Florida, during March, 1923, was in bathing on March 1.

supervening infection. He thought at the time that a fin of the fish had broken off in his foot but no attempt was made to determine its presence. He returned to his usual training duties at the end of the period of hospitalization, experiencing no difficulty with the foot, despite the fact that it was subjected to unusual stress in his pitching.

At the conclusion of the training period, the young man went to the Syracuse, N. Y., baseball club where he remained for a period of about ten days, working regularly. To quote his statement, he was "in good form." He was sent to the Fort Smith, Arkansas, club on June 10, 1923. Shortly after his arrival he began to complain of pains in the injured foot. He consulted me and the history of the injury as given suggested the possibility of locating by roentgenologic ex-

¹R. B. Taft: The Radiographic Detection of the Catfish Spur as a Foreign Body. RADIOLOGY, January, 1932, XVIII, 123, 124.



Fig. 1. Lateral view, showing the bony fragment in the soft tissues of the foot.



Fig. 2. Anteroposterior view, showing the serrated margin of the bony fragment.

amination a bony fragment in the foot. A rather large fragment of bone was demonstrated slightly posterior to the fifth metatarsophalangeal articulation and extending mesially into the plantar tissues. On the original film, the serrated margin of the fish bone is well demonstrated, the density of the

fragment being practically that of the bones of the foot. The fragment was readily removed and the patient returned to his usual duties in ten days.

A TRIPLE BONE LESION¹

By I. S. TROSTLER, M.D., F.A.C.R., F.A.C.P.,
CHICAGO

In November, 1930, G. M., a rather thick-set Russian man, 42 years of age, was sent to me by a general practitioner for examination of the right hip region. The patient, who walked with a slight limp on the right, was wearing a shoe with the right sole about one inch thick and the heel about one and one-half inches high.

He stated that, since childhood, his right leg had been shorter than the left, but that, until a few months before coming for the present examination, he had had no pain in the joint or hip region. During the four and one-half months preceding the roentgen examination the right hip joint had become progressively stiffer and more painful. When I saw him, he had less than 25 per cent of the normal motion in the joint. Abduction was particularly limited.

There was no history of injury or unusual illness.

A roentgenogram of both hips and the pelvis showed a slight atrophy of the entire right half of the pelvis. The left hip joint,

¹Presented before the Chicago Roentgen Society, Feb. 10, 1932.



Fig. 1. Triple bone lesion.

left acetabulum, and upper fourth of the left femur were normal. The right hip joint showed erosion or absorption of the cartilage of the joint surfaces. The space between the head of the femur and the acetabulum was reduced and decidedly at variance with the normal. There was an osseous extension outward from the upper outer border of this acetabulum. The right acetabulum was wider and rougher on its inner articular aspect than is normal and did not present the normal smooth outline. The head of the right femur presented a mushroomed outline, with shortening of the femoral neck and reduction of the density of the head, neck, and both trochanters. The femur was abducted and Shenton's line destroyed.

In the intertrochanteric region, an oblong or oval area of rarefaction, with a denser border or edge, was seen. This, to all appearances, was the remains of an abscess of the bone. Below this area (in the upper third), the shaft of this bone appeared to be normal.

SUMMARY

Summarizing the above findings, it is my opinion that—

1. There was Perthes' disease in early childhood;
2. There was a Brodie's abscess in the intertrochanteric region of the right femur;
3. There was at the time of the roentgenographic examination, an infectious arthritis in the right hip joint, with an effort at fixation, resulting in abduction for the purpose of lessening the tension within the joint.

CONGENITAL ATELECTASIS

DISCUSSION AND CASE PRESENTATION

By M. BRAVERMAN, M.D., and
S. BROWN, M.D.

From the Department of Roentgenology, Jewish Hospital, CINCINNATI, OHIO

It frequently occurs that the persistence of the fetal pulmonary state, which is physi-

ological to a limited degree during the first few days of life, can be diagnosed only with the roentgen ray, due to a lack of symptoms or signs. The condition may be either partial or complete, unilateral or bilateral.

Congenital atelectasis occurs more frequently in premature and feeble babies. Other causes are birth injury to the central nervous system, narcotization, inhaled meconium or amniotic fluid, and prolonged or difficult labor.

Atelectasis most often involves the paravertebral and central portions of the lungs, especially the areas close to the hilus. The expanded areas are seen at the periphery. This is undoubtedly due to the fact that the periphery of the lung is the most mobile.

Considerable degrees of atelectasis may be found at necropsy in an infant who, in life, presented few or no symptoms. Examination of the chest may present nothing definite except poor resonance throughout. Auscultation may sometimes reveal medium coarse râles or, more often, fine crackles or showers of fine crackles, especially when the infant is made to breathe deeply.

Recently it was our privilege, through the kindness of Dr. L. Friedman, to study the chest of an infant, Baby D., who was born of healthy parents at the Jewish Hospital November 18, 1930. A moderate degree of cyanosis was present for the first twelve hours following a prolonged and difficult delivery by version of a breech. The child, twenty-four hours post-delivery and presenting no symptoms or signs, was found to have a doughnut-shaped shadow (Figs. 1 and 2) in the right pulmonary field close to the heart on an anteroposterior view and overlying it on a lateral view. During the period of about four months, when the gradual disappearance of this shadow could be watched by serial X-rays, the child did not present any symptoms or physical signs. This singular roentgen-ray finding, interpreted by us as congenital atelectasis, has

slowly disappeared in a way that is said to be characteristic of this condition. With greater and more efficient pulmonary aëration, this doughnut-shaped shadow separated into smaller and smaller areas of more or less circular mottlings as time went on. It was noticed that the part of the atelectatic area closest to the mediastinum was the last to disappear. The area of lessened density in the center of the circular shadow may be accounted for by the fact that a bronchus filled with air seems to enter from the right hilar region to the middle of the atelectatic area.

The diagnosis of congenital atelectasis is made more frequently by the X-ray examination and the symptoms than by the physical findings. In the differential diagnosis among bronchopneumonia, miliary tuberculosis, pulmonary neoplasms, obstructive atelectasis, enlarged thymus, congenital syphilis, and eventration of the abdominal contents into the chest, recourse must be had to the history, symptoms, physical examination, and the clinical course of the condition as well as to the roentgen-ray films, which may have to be taken serially.

Considerable areas of atelectasis escape detection by any means but the X-ray. Films should be taken both during inspiration and expiration, preferably at the end of each phase, to rule out what may appear to be atelectatic areas occurring at the end of expiration. In infancy, expiration is much more complete than in adult life.

The prognosis as regards life depends on how early the diagnosis is made, the underlying cause, the extent of the atelectasis, the time of the institution of treatment, and the type of the treatment. Recent developments lend strong support to the frequent occurrence of pneumonia in cases of atelectasis (1).

It is good prophylaxis for as many in-

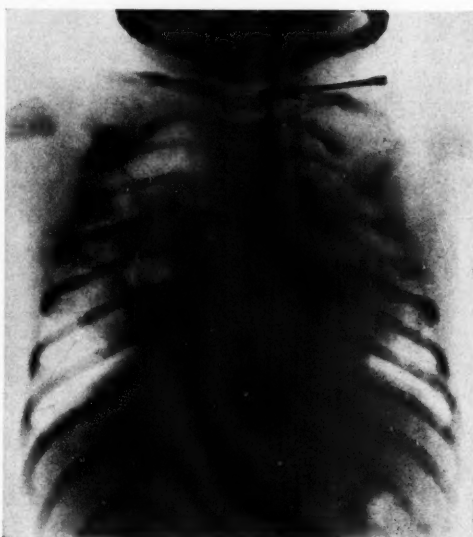


Fig. 1. Doughnut-shaped shadow in the right pulmonary field of an infant chest interpreted as due to congenital atelectasis.

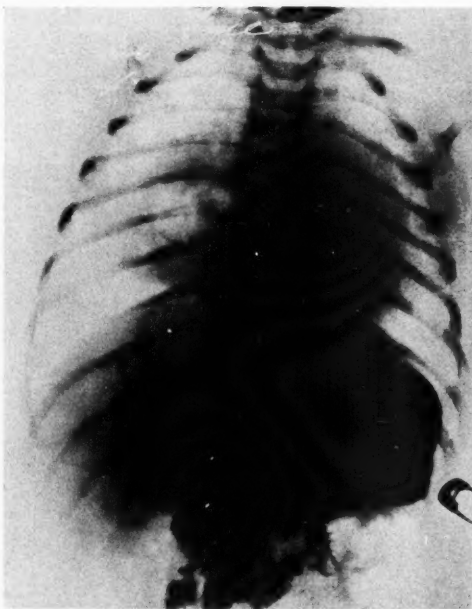


Fig. 2. Same case, five days after birth. Barium in the stomach and the proximal small bowel to indicate their normal position. This film shows more clearly the air-containing branch bronchus which enters the central clear area of the doughnut-shaped density.

infants as possible to have a ten-minute inhalation of a mixture of carbon dioxide and oxygen at least three times a day during the first few days of life as a measure against atelectasis and pneumonia (2).

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CHONDROMYXOSARCOMA OF THE OS CALCIS

By ERNST A. POHLE, M.D., Ph.D., and
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On Feb. 25, 1931, S. Y., white, female, aged 12 years, was admitted to the orthopedic service, University Hospital, with the complaint of pain in the left heel. She had not been able to use it in walking for the two weeks preceding her admission to the

hospital. The diagnosis of the referring physician was osteomyelitis.

It appeared that, in January, 1930, she had slipped on ice and hurt her left foot; the skin, however, was not broken. The parents thought she had a sprained ankle and applied hot dressings. She continued to walk, using her heel as little as possible. In September, 1930, the pain increased and the heel became slightly swollen. Cold seemed to aggravate the pain. In January, 1931, a physician was consulted; roentgenograms were taken, and a diagnosis of osteomyelitis made.

The general physical examination was essentially negative. The temperature varied between 97.8° and 100° Fahrenheit. There was swelling, with tenderness at the lateral aspect of the left heel but no limitation in motion and the patient walked normally. The roentgenograms of the foot, taken on Feb. 25, 1931, showed a sharply circumscribed, circular, punched-out area about 1.5 cm. in diameter on the medial margin of the plantar surface of the os calcis. This had broken through the cortex. There seemed to be no bone atrophy but moderate

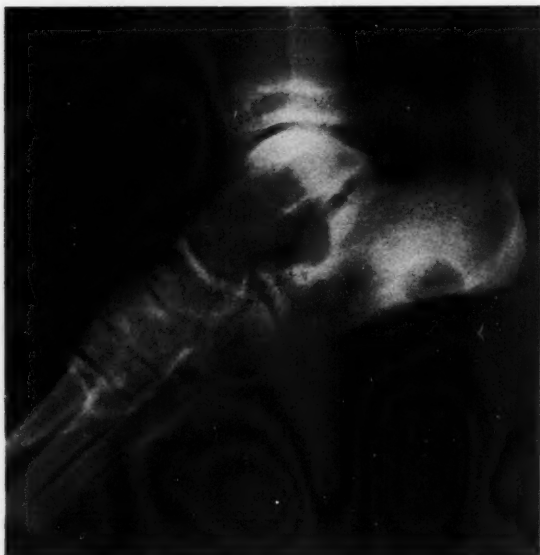


Fig. 1. Left foot, Feb. 26, 1931.



Fig. 2. Left foot, March 5, 1931, two days following operation.

sclerosis around the margin of the described lesion (Fig. 1). A tentative diagnosis of bone abscess or bone cyst was made. On March 3, 1931, the patient was operated upon through a lateral incision. The cortical bone covering the site of the cavity seen in the roentgenogram was removed with a chisel. The surrounding bone was hard, and the cavity was filled with a gelatinous material, slightly pearly gray in color. This material had broken through the cortex on the plantar surface, but there was no invasion of the soft tissue. The material was curetted out and a specimen sent to the laboratory for diagnosis. The hard sclerotic bone was cut away to leave no over-hanging edges and the wound was closed (Fig. 2).

The microscopic examination revealed several types of growth (Fig. 3). Numerous areas were composed of perivascular endothelial cells; occasionally multinucleated giant cells were seen. There was also imperfectly formed cartilage. All of the sections examined approached, in certain areas, the picture of a myxosarcoma. While the histologic appearance suggested a rather slow-growing tumor of a low grade of malignancy, it was nevertheless an osteogenic sarcoma. The diagnosis was chondromyxosarcoma.

Forty-eight hours after the operation X-ray deep therapy was started in prefer-

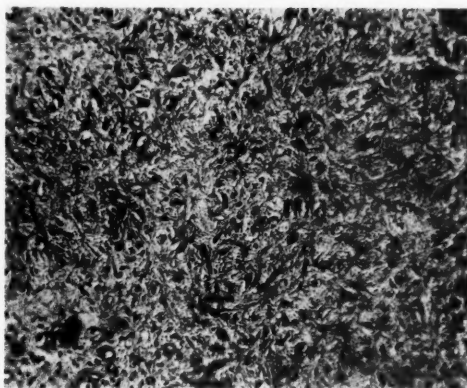


Fig. 3. Photomicrograph of removed tissue (100 diameters).

ence to radical surgery. From March 5 to April 10, 1931, a total of 1,200 r (surface dose) was applied over the incision, using a field of 6.5×6.5 sq. cm., 50 cm. F.S.D., and an effective wave length (Duane) of 0.16 Ångström unit. The changes in the bone at the site of the former lesion are well demonstrated in Figures 4 and 5. The last roentgenogram (Nov. 16, 1931) revealed a circumscribed area in the os calcis, slightly less dense than the surrounding bone. The sclerosis around the margin, as described at the first examination, was still present. It was noted, however, that the bone structure was apparently nearly homogeneous. It may also be mentioned here



Fig. 4. Left foot, April 11, 1931.



Fig. 5. Left foot, Nov. 16, 1931.

that X-ray therapy did not interfere with the healing of the incision.

The patient is now enjoying good health and can walk freely. Roentgen examination of the chest has failed to show any abnormalities. This patient is returning once a month for re-examination.¹

We have reported this case for two reasons. In the first place it is interesting from the diagnostic standpoint because it demonstrates the difficulties encountered in such cases, and, secondly, because we feel that X-ray deep therapy has been of definite benefit in clearing up the local lesion.

A CASE OF CARCINOMA OF THE THYMUS

By J. J. COLLINS, M.D., Radiologist, the John D. Archbold Memorial Hospital, THOMASVILLE, GEORGIA

A case of thymic tumor is reported in which the clinical diagnosis was cellulitis of the neck, with sinus thrombosis; the roentgen diagnosis was abscess or tumor of the upper mediastinum, and the pathologic diagnosis, made postmortem, was carcinoma of the thymus, with metastases to the lungs, liver, and mesenteric lymph glands.

Anamnesis.—The patient, colored, male, aged 28, was admitted to the John D. Archbold Memorial Hospital on Aug. 25, 1930, and died on Aug. 28, 1930. The past history was unimportant. The present illness began five weeks previous to admission with sore throat, toothache, fever, and general malaise. Several days later swelling of the neck was noted which soon became progressively more marked. Edema of the eyelids appeared and later marked difficulty in breathing and swallowing was noted. For three or four days previous to admission nothing could be swallowed except small amounts of fluid.

Physical Examination.—Temperature 101 degrees F., pulse 120, respiration 30. The patient was a well-nourished, well-de-

veloped colored male. Respiration was labored, the neck markedly swollen, the face and eyelids edematous, and there was a bilateral exophthalmos.

The swelling of the neck was uniformly hard and smooth; nothing suggesting enlarged glands in this or any other area was found. No dilatation or prominence of the superficial vessels was discernible. A bloody mucus discharge exuded from the mouth and nose. There were coarse râles and exaggerated breath sounds throughout both lungs. There was a wide area of dullness over the upper mediastinum. No edema of the arms or thorax was noted.

Laboratory Findings.—White blood cells, 9,150; polymorphonuclear leukocytes, 80 per cent; eosinophiles, 2 per cent; transitional cells, 4 per cent; lymphocytes, 14 per cent. Red blood cells, 3,350,000. Hemoglobin, 60 per cent. The blood sugar and non-protein nitrogen were within normal limits. The urine, which contained a few granular casts, had a specific gravity of 1.035. The Kahn test was negative.

Roentgen Report.—Examination of the chest was made August 26, 1930. A single film only was made because of the semicomatose condition of the patient. There was a large dense mass, 11 cm. in width, in the upper mediastinal area, extending laterally on both sides beyond the mediastinum. The upper border extended above the sternoclavicular articulations and the lower border fused with the heart shadow. The lateral borders were well defined and regular. There was definitely a diminished aëration of the upper lobe of the right lung but no other evidence of pathology. Considering the history and course of the illness it was thought that the condition was mediastinal abscess rather than tumor.

The patient died on his fourth day in the hospital. The salient points of the postmortem examination were: The neck was markedly swollen and the face and eyelids edematous. There was a marked bilateral

¹In April, 1932, the patient was still well.

exophthalmos. None of the superficial glands was palpable. The pericardial and pleural cavities contained no increased amount of fluid. A large mass, shaped like an inverted pyramid, filled the upper mediastinum. This was of grayish color and cartilaginous consistency. There was no infiltration of the lungs, sternum, or surrounding structures, but there was a very definite compression of the lungs, trachea, and vessels of the mediastinum. No thrombi or erosions were found in any of the vessels. The pleural surfaces of the lungs showed numerous small, avascular, grayish nodules. The liver contained multiple small, grayish, necrotic areas. Cultures from these were sterile. In the abdominal cavity there were three enlarged mesenteric glands. No pathology was found in the brain.

Sections from the tumor and metastatic areas were examined by Mary J. Erickson, M.D., and a diagnosis of an undifferentiated cell carcinoma was made. Sections were submitted to the late Dr. Warthin, whose report was as follows:

The greater part of this neoplasm is necrotic. The living areas present the appearance of an undifferentiated cell carcinoma, very medullary in areas. It may be a so-called thymoma of carcinomatous type. It is distinctly epithelial in type and not lymphoblastic.

In 1930, Doub (1), in reviewing the literature of thymic tumors, found that approximately a hundred cases of all types had been reported. To this number may be added five other cases reported by him. Of these cases of thymic tumor approximately 20 were carcinomas, the remainder being for the most part sarcomas.

Brannan (2), in 1926, reviewing the literature of carcinoma of the thymus, stated

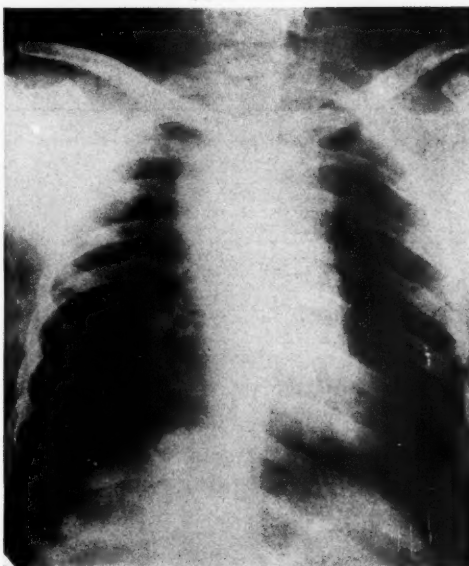


Fig. 1. Upper mediastinal tumor with clear-cut borders. There is no evidence of invasion.

that 19 authentic cases had been reported. This number included a case reported by him and one by Foot in that year.

The case of carcinoma of the thymus here reported is one which did not present the usual local invasion of surrounding structures but did present the pyramidal form and the compression of the vessels of the mediastinum described by Brannan. Metastases to pleura, liver, and mesenteric glands had also occurred. The course of the disease, following the initial symptoms, progressed rapidly to a fatal termination. There were no palpable glandular enlargements to suggest the diagnosis of tumor or to afford biopsy specimens.

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EDITORIAL

LEON J. MENVILLE, M.D. *Editor*
BUNDY ALLEN, M.D. *Associate Editor*

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OBJECTIVES IN RADIOLOGY¹

Radiology, the newest member of the medical family, is still experiencing the growing pains incidental to reaching a useful maturity. Most of us have watched its development from the time of the old static machine, which, if it was capable of impressing faintly the bones of the hand on a photographic plate, was considered a wonderful thing. With the development of increased power through the use of larger induction coils and the introduction of the transformer came the realization, and sadly so, to many of the pioneers, that somehow these rays had a decided effect on tissue cells. This, in turn, led to further study to determine to what extent these rays might be used to affect tissue cells deliberately, particularly in the various malignant diseases. The introduction of the Coolidge tube and further refinements in apparatus, such as the movable grid, double intensifying screens, and films of greater speed, led finally to diagnostic endeavor to interpret pathology in the soft tissues as presented by the use of contrast media of various kinds for outlining the gastro-intestinal tract; visualizing the gall bladder, the kidney pelvis, ureters, and bladder, and tracing the outlines of cavities and sinuses. All of this within a period of three and a half decades! Is it any wonder

that the application of radiology should to-day find itself in a more or less chaotic situation? On the one hand we have the few sincere men striving to place radiology where it belongs; on the other we have the multitude trying to make interest charges on equipment sold to them by enterprising salesmen. In the first instance the object is humanitarian and scientific, in the second, purely economic.

What is the greatest objective in radiology? Service. Service to hospitals, service to their staffs, and, most important of all, intelligent service to the patient, who, in this case, is the ultimate consumer. The patient is entitled to the best service and opinion possible at all times and I am happy to say that, for the most part, he is getting them, else applied radiology would soon pass into disrepute.

The larger hospitals throughout the country, practically without exception, employ full-time directors for their X-ray departments. But what about the bulwark of the Nation's health defense, the hundreds of smaller hospitals that cannot afford to employ full-time directors? We cannot expect a small hospital to operate its X-ray department at a financial loss, neither should any hospital expect income from its X-ray department to offset losses from elsewhere within the institution. The reputation for thoroughness which a hospital might acquire through an efficient X-ray department, and the additional number of patients who might, for that reason, use the hospital should be a full reward. Apparently, then, the only solution for adequate service within the means of the small hospital, for the present at least, lies in some sort of part-time arrangement with a competent and recognized roentgenologist.

¹Read before the Radiological Society of North America at the Seventeenth Annual Meeting, at St. Louis, Nov. 30-Dec. 4, 1931.

In an effort to determine the value of a roentgenologist to a small hospital, and to evaluate this in tangible terms, a 65-bed hospital was chosen. Prior to the early part of 1930, the procedure in the hospital² selected for this study was quite similar to that of many others of approximately the same size. That is, the hospital employed a technician and the referring physician interpreted the film. All of the X-ray records and films from 1925 to January 1, 1931, were carefully examined in order to contrast the work done before a part-time roentgenologist was employed with the work done after this arrangement had been made. The outstanding features of this survey will follow, and I might add that the roentgenologic supervision in this hospital is that of another than myself, and, therefore, the conclusions drawn are unbiased.

The equipment, which was installed new in 1925, is capable of doing as high-grade work as can be done anywhere. It is still in use, so no corrections need be made for change of equipment.

The following comments will give a general idea of the character of work done in this hospital in 1925 and 1926. Radiographs of bony structures, including lumbar and dorsal spines, were uniformly good. However, no lateral projections of the spine were found. Stereoscopic views were limited to the skull and, in a few instances, to the pelvis, and did not include any of the smaller regions, for example, the shoulders. Films falling into the gastro-intestinal classification contained a few flat films of the abdomen. In cases in which contrast media were used, the films were limited for the most part to one or two, all being taken in the standing position. Films of the gall-bladder region were all without contrast media; in only one case could the gall bladder be visualized. Kidney films in general were unsatisfactory as far as being informative

was concerned. Only one case had had retrograde pyelography and in that only the ureter was visualized. Chest films were satisfactory throughout except that they were not taken stereoscopically.

In 1927, films of the gastro-intestinal tract showed some improvement in that a greater number of films were used in each case and the contrast meal was followed into the colon. Several of these examinations were made in the horizontal position with, of course, increased detail and interpretative possibilities. Some of the gall-bladder examinations during this year were made with oral dye in capsule form; frequently the capsules in the colon were more prominent than the object of their use.

The years 1928 and 1929 continued to show improvement, especially in gastro-intestinal work. Gall-bladder films were capable of more conclusive interpretation and films of this region following intravenous dye were found. Chest films were more often taken stereoscopically. In all of these years, films of the opposite extremity or side for comparison in checking a doubtful finding or a congenital anomaly were conspicuously absent. A few interesting films were found but no effort had been made to take additional films in other positions or to follow them up with subsequent exposures. What a wealth of interesting material must lie buried in the hospital files of the country! No written reports accompany any of the cases examined during these years except that in one or two instances the individual physician may have referred the films to a roentgenologist for some special reason of his own. Taking into consideration that there was no one to make suggestions for proper procedure the work done was very satisfactory as far as it went and no criticism is intended.

Early in 1930, a roentgenologist was employed to supervise the X-ray Department and to visit the hospital one day a week.

²Community Hospital, H. H. Windsor Memorial X-ray Laboratory, Geneva, Ill.

He is still retained in this capacity. It is interesting to report that this hospital was approved as a fully standardized hospital at the fall meeting of the American College of Surgeons. It must follow, therefore, that a part-time service of the proper kind is satisfactory. A comparison of the films and the general management of the department for 1930 with those of the preceding years should show some differences.

In the first place, each case carries with it a written report of the shadow features presented in the films, over the signature of the roentgenologist in charge. Secondly, fluoroscopic procedures have a more definite value. Thirdly, the number of cases of soft-tissue examinations, such as kidney and gall bladder, have increased in number, the latter 100 per cent over the preceding year. Fourthly, films of the opposite side for comparison are almost a matter of routine. Fifthly, the X-ray findings and interpretations are accepted with more confidence by the members of the staff. And, lastly, opportunity is had for proper therapeutic procedures.

Let us now look at the situation from the financial side. The gross income from this X-ray Department in 1925 was \$1,286.50. This amount was a little more than doubled in 1926, due principally to the fact that 1925 was only an eight-month year in this department. The gain each year following was irregularly upward but only at a rate of two or three hundred dollars each year. The gross income for 1929 was \$3,033.50, approximately \$100 less than in 1928. For the year 1930, when roentgenologic service was had for the last ten months, the gross income was \$4,583.00, an increase of 50 per cent. In the present year, 1931, the gross income to October 1 is \$3,507.00; not a bad showing in this period of world-wide mental depression. This does not mean that the hospital is any better off financially so far as its X-ray Department is concerned. In fact, its net income is less

than in the period prior to 1930, but it is rendering a better service to its patients and a better service to its staff. After all, that is the ultimate function of any hospital, and no hospital management should feel that it can afford not to provide the best in its radiology department.

The exact nature of the financial arrangement between the hospital and the radiologist is immaterial so long as the relationship is harmonious and neither one feels that the other is getting the better of it. No arrangement can be satisfactory under which the cost of an X-ray examination to the hospital is in the balance. Then only the most obvious conditions will call for a radiologic examination, and other cases in which this examination is of more importance and the indications less obvious will not receive the full benefit of their hospital stay. Probably a straight salary on a part-time basis, adjusted from time to time on the value of the work done, is conducive to the best general results and will lead ultimately to a larger volume of work than an arrangement under which the cost is considered each time.

Patients are human and have the traits with which Nature endowed them: I refer particularly to that of possession. The question of ownership of films is quite generally conceded to lie with the individual or hospital making the exposures; but a film is something tangible and understandable to a degree by the patient. Therefore, it is not surprising that he should feel that he has an interest in the film and that it should be available to him in shopping around a bit. Imagine a patient going from doctor to doctor with a ureameter in one hand and a sedimentation glass in the other. It is all a matter of education and roentgenologists, themselves, are largely to blame for this situation. How often do we not hear, "We'll take a film of this and see what you have." Make it one of your objectives to dignify your profession. Always refer to this kind of work as an "X-ray examination," or a

"radiographic study"; perhaps the latter is better. Films are only a means to an opinion and in the final analysis the opinion is the entity for which the patient pays.

Another important objective should be to make yourselves consultants in every sense of the word. For the most part a roentgenologist seems content to sit at the viewing box and report what he sees in the shadows. Would it not be better to be seen more often at the bedside of the patient? It will give the patient a good impression and he will feel that everything possible is being done; it will be helpful to the attending physician; suggestions to him of another angle from which to attack his problem will often be appreciated. In this way the roentgenologist can order the exposures necessary for the best results instead of accepting whatever projections the attending man may think necessary. In any event, insist on a history of all obscure or doubtful cases, or at least a synopsis of the outstanding objective and subjective symptoms. Patients are glad to have X-ray examinations made; they are comprehensible to them and, therefore, received by them with confidence. See to it that the character of your work continues to merit this confidence.

What of the future? Forecasts are always hazardous but interesting. Could anyone have predicted twenty years ago what the present gives in all the branches of radiology and to what extent radiology is being used to-day in the fields of diagnosis and therapy? A few years ago, surgery was the only accepted method of treatment in malignant conditions; to-day irradiation shares equally with surgery in importance. Perhaps the future, through better facilities and better technic in application, will find irradiation the only accepted method of treating cancer. Who knows? There will be less surgery done in the next decade, everything else being equal, for, as refinements in apparatus and methods are perfected, roent-

genologists will keep pace with increased skill in interpretation. The net result will be less necessity for undertaking surgical procedures on an exploratory basis. Irradiation is already displacing surgery in the treatment of some cancerous conditions, notably in the female pelvis and in malignancies about the tongue, mouth, and face. Eradication of cancer is a gargantuan task; neither the surgeon nor the radiologist can afford to ignore the other, and each must have implicit confidence in the pathologist. With the establishment of cancer clinics throughout the country, under responsible guidance, the future holds much hope. In this work as in all of the problems of the future, radiology can be depended upon to contribute its full share in an ever increasing sphere of usefulness.

H. T. MOSTROM, M.D.

Batavia, Illinois.

COMMUNICATIONS

FLORIDA RADIOLOGICAL SOCIETY

The regular annual meeting of the Florida Radiological Society was held in Sarasota, Florida, on May 2, 1932, at the Sarasota Terrace Hotel. Lester W. Cunningham, M.D., of Jacksonville, President of the Society, presided. Informal presentations of case reports and demonstrations of interesting roentgenograms were featured at the morning and afternoon sessions.

The following officers were elected, to serve until the spring meeting, 1933: *President*, Orion O. Feaster, M.D., St. Anthony's Hospital, St. Petersburg, Florida; *Vice-president*, Frederick K. Herpel, M.D., Good Samaritan Hospital, West Palm Beach, Florida; *Secretary-Treasurer*, W. McL. Shaw, M.D., 418 St. James Bldg., Jacksonville, Florida.

Tours to Russia.—Conrad K. Gale, M.D., 225 West 86th St., New York City, has asked RADIOLOGY to announce that an invitation has been extended to American physicians and surgeons by the medical associations of Leningrad, Moscow, and other cities of Soviet Russia, to visit their hospitals, clinics, research laboratories and similar institutions.

This is the first occasion ever offered the American physicians to inspect officially these most interesting phases of Russian medical life.

The group of American physicians, which is now forming, will sail this summer. Those interested can get full information from Compass Tours, 55 West 42nd Street, New York City.

Our attention has been called to a paper by I. S. Trostler, M.D., in the April, 1932, issue of the *Illinois Medical Journal*, page 343. The title is "The Commercial Roentgen Laboratory—Some Good Reasons why they should not be Tolerated or Patronized," and such of our readers as are interested in this timely—in this country, at least—question may read the paper with interest.

BOOK REVIEWS

UNITED STATES ARMY X-RAY MANUAL. Authorized by the Surgeon-General of the Army. Second Edition, rewritten and edited by LT. COL. H. C. PILLSBURY, M.C., U. S. A. Pages 482, with 228 illustrations; 12 mo, flexible leatherette. Published by Paul B. Hoeber, Inc., New York, 1932. Price, \$5.00.

This book has been sufficiently modified from the Manual intended primarily for the student of military medicine to permit it now to be classed as a suitable text-book for the instruction of medical students anywhere. There are still a few pages devoted to military matters, but, after all, there is no strict difference between the practice of roentgen-

ology in military and in civil life. The problems of physics and of diagnostic internal medicine, of fractures and bone tumors are common to civil and military life. No space has been given to therapy. The text is carefully prepared. The illustrations are numerous and well chosen, and the book is a commendable introductory work for those who wish to take up the study of roentgenology.

JAMES T. CASE, M.D.

SURGICAL PATHOLOGY OF THE GENITO-URINARY ORGANS. By ARTHUR E. HERTZLER, M.D., Surgeon to the Agnes Hertzler Memorial Hospital, Halstead, Kansas; Professor of Surgery, University of Kansas. A volume of 286 pages and 222 illustrations. Published by J. B. Lippincott Co., Philadelphia, 1931. Price, \$5.00.

This monograph is one of a series of monographs which Dr. Hertzler is writing on surgical pathology. The subject matter of this volume is disposed of in three parts, namely, diseases of the external genitalia in the male, diseases of the prostate and the bladder, and diseases of the kidney and ureter. The descriptive nature of the discussions and the excellent illustrations of gross specimens and the photomicrographs hold the reader's interest from the beginning to the end. The bibliographies, one at the end of each chapter, denote a critical review of the subject and add much to the value of the book as a reference volume.

The author has successfully and efficiently performed his task of presenting the subject from the viewpoint of the general surgeon, freed as much as possible from the complications of the specialists. Rarely does one encounter pathologic descriptions and classification of tumors so simplified. The emphasis which he has placed on the similarity of the embryonal tumors as found in the testicle and kidney is commendable.

For tumors of the testicle he has adopted the classification proposed by Hinman because it clarifies the subject for the surgeon. This includes seminomas and embryomas. The seminomas are so named because the cells are

made up pretty much of one type, frequently lobulated, especially in the less malignant ones. He states it is the most common testicular tumor and is distinctly one of adult life. Those of this group which seem to develop from seminiferous tubules, he feels, are merely those which least deviate from the normal. These tumors metastasize early, and usually before the primary tumor is noted have already extended to the lungs, retroperitoneal, and supraclavicular nodes. The prognosis has been much improved with the advent of the X-ray, since the cells of this group are radio-sensitive. Embryomas (teratomas) from the other group are composed of more maturely formed tissues, such as cartilage, muscle, glandular structures, etc. He regards a tissue which is a *biologic impossibility* as originating from a teratoma of the testicle.

Disease of the prostate is considered under three general heads: its inflammations, its hypertrophies, and its malignancies. The importance of accurate evaluation of all the factors influencing prostatic obstruction is stressed, since not infrequently the prostate is accused of producing symptoms totally unrelated to it. The secondary results of enlarged prostates such as hypertrophied bladder wall, the formation of cellules and diverticula, the cystitis incident to catheterization, and, finally, pyelonephritis are well described. A pathologic explanation of the causes of failure after prostatectomy, aside from a wrong diagnosis, is stone formation. The author feels this is more common when the prostatic bed is packed with gauze to control bleeding, and that a blood clot furnishes excellent nuclei for the formation of stones. The failure to remove enough capsule and excessive scar formation in the prostatic bed are noted. In dealing with carcinoma of the prostate the reader's attention is directed to the characteristic hard and nodular feeling of the gland which is the earliest and most reliable of all signs of malignancy. The pathogenesis and the pathology are logically reviewed.

The two types of papillomas of the bladder, the villous, which he considers more or less benign, and the broad-based, usually malignant, are considered separately. He states that

the points of differentiation are in the arrangement of the villi and epithelium of the stalk, and the surgical pathologist should not offer an opinion as to its identity without an examination of the stalk. Epitheliomas and sarcoma of the bladder are considered separately also.

The chapter on urolithiasis covers this subject in an excellent manner. The author has gone into the etiology of calculi, with many remarks regarding their distinctive characters. The photographs of the various types of stones and the secondary changes produced in the bladder, ureters, and kidneys are excellent. Infections of the kidney are divided in the primary and secondary groups: under the primary infections of the kidney Brewer's kidney is discussed at great length. Brewer's kidney represents an acute lesion due to embolism from regions elsewhere in the body which produce infarcts, with resultant intense reactions of the entire body. Some of these are sufficiently infectious to produce abscesses, but the author feels that a great majority of these subside spontaneously, due to some bactericidal factor in the kidney similar to that known to be present in the liver. He presents photographs of kidneys showing the resultant scars of these infarcts which have undoubtedly occurred a matter of years before the kidney was sufficiently involved to require surgical removal.

Essential hematuria is regarded as due to an unlocalized focal renal infection. Secondary infections of the kidney such as result from stones, prostatic obstruction, tumors, etc., are regarded as ascending infections and caused by the colon bacillus. The author agrees with Burns and Swartz on this point.

In dealing with tuberculosis of the kidney the author points out that the kidney, next to the lung, is the commonest site of tuberculosis, and that, on account of the accessibility of the kidney to the surgeon, there has been too much tendency on his part to regard kidney tuberculosis from the operative standpoint only. Careful differentiation between the acute and chronic forms of tuberculosis is discussed. The lesions of chronic tuberculosis of the kidney are divided into four groups:

(1) tuberculous ulceration of the apices of the pyramids; (2) chronic disseminated tuberculosis; (3) cheesy-cavernous forms; (4) mixed infections.

Under cystic disease of the kidney are grouped together such conditions as solitary cysts, cysts associated with chronic nephritis, congenital polycystic disease, a number of very rare cysts, and hydronephrosis. Hydronephrosis was placed in this group merely as a matter of convenience to him for its discussion. The various theories underlying polycystic disease of the kidney are briefly but carefully reviewed.

The author presents an admirable classification for tumors of the kidney. This classification includes the more common tumors, while those which are considered rare are grouped separately and are referred to principally in the bibliography. The classification of the more common tumors of the kidney is: First, adenocarcinomas which are derived from the kidney tubules, remaining more or less spherical but gradually invading the surrounding kidney tissue; second, hypernephromas (fetal adenomas). This latter is the commonest group of kidney tumors. The author objects to having these tumors designated as carcinomas, since there is nothing in their structure or life history to suggest a confusion with carcinomas. The third group in the classification includes teratomas of infancy and childhood—the embryonal tumors of the kidney usually designated as sarcomas. These are characterized by their diversified cell structure, the author stating that the variety of cell structure and arrangement is not equaled by any other tissue. They grow rapidly, usually running their course in from six months to three years. The fourth group includes tumors of the renal pelvis and ureters. Tumors of the renal pelvis are of two types, the papillar and the squamous. The pathogenesis of these two types of tumors is fully described.

Every phase of the book is well prepared and interestingly presented. It should be recommended to genito-urinary surgeons, surgeons in general, and students of surgical pathology.

VIRGIL S. COUNSELLER, M.D.

ATLAS DE RADIOGRAPHIE OSSEUSE. II.— PATHOLOGIE (SQUELETTE PATHOLOGIQUE).

1. Lésions traumatiques, by G. HARET, A. DARIAUX, Electro-radiologistes des Hôpitaux de Paris, and JEAN QUÉNU, Professeur agrégé à la Faculté de Médecine Chirurgien des Hôpitaux de Paris. 2. Lésions non-traumatiques, by ETIENNE SORREL, Chirurgien de l'Hôpital Trousseau, Anc. Chirurgien en chef Hôp. Mime de Berck, and MME. SORREL-DEJERINE, Ancien Interne des Hôpitaux de Paris. Two volumes of 344 pages, 897 figures, of which 519 are radiographs and 378 drawings. Published by Masson et Cie, Paris, 1931. Price, 310 francs for the two volumes.

This atlas in two volumes presents a most interesting review of the subject. It will have a distinct value in a reference library. The one drawback, which applies to all similar attempts, is the necessary limitation of the number of illustrations, but the choice of these has been made wisely, resulting in a wide range of subject material presented clearly and comprehensively.

Diagrammatic sketches accompanying the majority of the illustrations elucidate the anatomico-pathologic changes from the normal and add considerably to the value of the books as reference volumes. This applies particularly to the first volume on fractures and dislocations; the accompanying sketches are very helpful in interpreting the roentgenographic reproductions of various types of fracture and the resultant deformities.

The limitations are more apparent in the second volume, but one is surprised by the number of subjects touched on and the excellence of the reproductions, allowing many subjects to be well presented by a single illustration. Tuberculosis of bone and joint, including the spine, is particularly well illustrated. Characteristic examples of syphilitic bone lesions are well chosen. Bone tumors are limited in number but the types have been particularly well chosen to show the pathognomonic characteristics of each. Various types of the arthritides, the arthropathies associated with central nervous system syphilis and syringo-

myelia, osteitis deformans, von Recklinghausen's disease, multiple congenital exostoses, epiphysitis in the spine, rickets, achondroplasia, osteochondritis juvenilis and the coxa varas of adolescence are all well illustrated.

A most interesting group of congenital anomalies and congenital absence of bones is presented. Excellent illustrations of various

grades of osteomyelitis and melorheostosis, hydatid cyst of the ilium, osteochondritis dissecans and osteochondromatosis round out a volume which will be most useful in determining the nature of the rare lesions periodically met with in the routine of a roentgenologic practice.

C. G. SUTHERLAND, M.D.

ABSTRACTS OF CURRENT LITERATURE

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J. N. Ané, M.D.
Henry Bayon, M.D.
Samuel Brown, M.D.
John R. Carty, M.D.
B. J. DeLaurel, M.D.
M. J. Geyman, M.D.
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ABSCESS

Subphrenic Abscess. D. C. Elkin. *Jour. Am. Med. Assn.*, Oct. 31, 1931, XCVII, 1279-1283.

A study of subphrenic abscess is largely anatomic, since the pus is localized in well-defined areas. Barnard completely described the subphrenic spaces and divided the subdiaphragmatic area into five regions. The author discusses each of these in detail. Infection spreads along anatomic lines to well-mapped subphrenic areas. A knowledge of these areas is necessary for diagnosis and proper drainage.

The greatest help in diagnosis is roentgen examination. The diaphragm is elevated, fixed, and frequently deformed. If gas is present, it can be easily seen. Pneumoperitoneum may be of great value in determining the presence of adhesions between the diaphragm and the liver.

The only favorable outcome without operation is perforation into a bronchus; however, without operation, practically all patients die. With operation, the mortality is approximately 50 per cent. The transpleural operation, done in two stages, is advocated as the safest and most direct approach for abscess above the liver.

CHARLES G. SUTHERLAND, M.D.

BONE (THERAPY)

Fractures of the Calcaneus: The Subcutaneous Circular Metallic Suture in Those of Postero-superior Angle. Enrique Finochietto and Marcelo Fitte. *La Prensa Méd. Argentina*, Nov. 30, 1931, XVIII, 831-835.

Since fractures of the postero-superior angle of the greater tuberosity of the calcaneus, also known as Boyer's or Destot's fracture, are so difficult to reduce and the results so unsatisfactory, the authors introduce a method which they consider excellent. They review the methods advocated and their pitfalls, and believe that the method described by them gives an assurance of reduction, there being no such long immobilization, besides.

Their method is as follows: After due antisepsis of the ankle, a mark is made on its external surface which corresponds to the point where the superior border of the calcaneus ought to be after correction. Through this point, which is more or less half way between the posterior border of the malleolus and the posterior cutaneous surface of the Achilles tendon, a curved Doyen needle is introduced. It is first passed upward and then horizontally in a tangential line to the superior surface of the displaced calcaneous fragment, coming out on the anterior surface just opposite to the point of introduction. When the eye of the needle comes out, a wire is attached and the needle pulled out so that it will go through the same route as before. Then the needle is in-

troduced through the internal surface, following an imaginary line running tangentially to the posterior part of the internal surface of the calcaneus, coming out at the ankle. The needle is then carried upward, following close to the calcaneus and coming out where the wire was left before. The wire is then attached and the same course followed. A semi-circle has thus been followed. The next step is to carry the needle in a similar manner but through the external surface of the ankle. The wire is then pulled through the same tract and finally returned to the point at which the needle was originally introduced, thus forming a complete circle. The reduction is performed by twisting the ends of the wire, which is cut close to the skin, the incised point being covered with gauze. The foot is then immobilized for two weeks by means of plaster of Paris. The authors then present two cases with radiographs before and after reduction, which showed excellent results.

N. G. GONZALEZ, M.D.

BONE DISEASES (DIAGNOSIS)

Charcot's Disease of the Hip Joint; Report of a Case. Curtis A. Hunsaker. *Med. Bull. Veterans' Administration*, February, 1932, VIII, 155, 156.

This is a case report of an ex-service man, 30 years of age, who complained of dizziness, blurring of vision, and occasional sharp pains in and about the right hip joint. He had contracted syphilis, in 1918, and had received antisyphilitic treatment for a period of ten months. At the time of admission, the physical condition of the patient was generally good, except for a speech defect and loss of reaction to light by the pupils. Spinal and blood Wassermann examinations were positive. Examination of the right hip joint revealed very little swelling and no evidence of inflammation.

The patient soon began to walk with a decided limp and, as the disease progressed, complained less of the sharp, stabbing pains. He also showed a definite change in his mental condition, having periods of depression and a general emotional let-down.

The destruction of the joint was slow and insidious but eventually amounted to an almost complete disintegration of the hip joint. The head of the femur was almost completely destroyed and the acetabular cavity was widened and showed much disintegration.

This case was believed to represent the osteosclerotic type of the disease, in which there is an increased hardening and density of the bone substance. The author emphasizes the value of the assistance of modern laboratories in distinguishing this case of Charcot's joint from some form of rheumatism or clinical arthritis.

J. N. ANÉ, M.D.

A Case of Necrosis of the Epiphysis after Healed Fracture of the Neck of the Femur. Rolf Euren. *Acta Chirurgica Scandinavica*, Dec. 3, 1931, LXIX, 8-20.

This is the report of a case of partial necrosis of the epiphysis in a boy, 13 years of age, following fracture of the neck of the femur, which had seemingly healed and was functioning well, as shown by clinical, and roentgenologic examinations.

For more than eight months after the accident signs of consistent necrosis were visible in the upper lateral portion of the epiphysis, followed by resorption and softening in the part affected, together with fragmentation and bowing due to weight-bearing. Regenerative processes gradually led to healing, with a resultant coxa plana deformation of the head; on the other hand, the articular cartilage seems not at any time to have suffered noteworthy pathologic changes.

Analogous to the healing of medial fractures of the neck in persons of advanced age, the author believes that a more or less complete necrosis of the epiphysis started in the present case, as a direct result of the fracture. Insufficient nutrition, due to original vascular lesions in the capsule, in the course of the following restitution led to lasting pathologic changes, of which the location and aspect were affected by mechanical factors and by the distribution of the blood vessels in the bone.

In accordance with this view of the case, the author emphasizes the necessity for extending the period of treatment in cases of fracture of the neck of the femur in children.

W. W. WHITELOCK, Ph.D.

Multiple Manifestations of Subchondral Necrosis (Osteochondropathia Juvenililis, Osteochondritis Epiphysitis). W. C. Martin and Hugo Roesler. *Am. Jour. Roentgenol. and Rad. Ther.*, December, 1931, XXVI, 861-867.

With two-year follow-up studies, the case of a girl, eleven years of age, is presented, who showed multiple areas of subchondral bone disease in the femoral heads (resembling bilateral Perthes-Calvé-Legg's disease), the eleventh dorsal vertebra (Calvé's disease), the carpal scaphoid (Preiser's disease), the metacarpals and metatarsals (Köhler-Freiberg's disease) and also in the astragali and clavicles. Symptoms and physical findings were limited to the back and hips, and the only active therapy consisted in a spine fusion operation at the level of dorsal kyphosis. The disease is considered by the writers not to be one of endocrine disturbance or disturbance in calcium metabolism but rather a specific epiphyseal disease. Because of the tendency toward spontaneous healing, palliative measures only are indicated until the disease becomes stationary.

J. E. HABBE, M.D.

Slipping of the Upper Femoral Epiphysis: A Study of Seventy Cases. Albert B. Ferguson and M. Beckett Howorth. *Jour. Am. Med. Assn.*, Dec. 19, 1931, XCVII, 1867-1872.

This is a study of seventy cases of a condition occurring between the ages of 8 and 17 years, described in the literature as epiphyseal fracture, separation or slipping, epiphyseal coxa vara, adolescent rickets, pathologic fracture, and femoral osteochondritis of adolescence. It is a disease characterized by weakening of the epiphyseal disc at the femoral head, permitting subsequent displacement of the head in the neck. It has been suggested that the disease is due to trauma, static forces, rickets, osteomalacia, infection, and endocrine imbalance. The pathologic features are sclerosis, thickening and avascularity of the soft tissues about the neck, with absence of any primary disease of the bone or cartilage. Four stages are described: Preslipping, slipping, quiescent, and residual. Definite symptoms, physical signs, and roentgenographic evidence of the disease are always present in the preslipping stage. Early diagnosis is essential for the best results. Adequate rest for the hip is the most important factor.

CHARLES G. SUTHERLAND, M.D.

CANCER (DIAGNOSIS)

The Present Status of Cancer Research. M. Borst. *München. med. Wchnschr.*, Oct. 9, 1931, LXXVIII, 1745-1750; also October 16, LXXVIII, 1785-1790.

In a very precise manner this excellent German pathologist reviews the past and present of cancer research. It cannot be denied that cancer is on the increase, although very slowly. At present animal experimentation appears to prevail in the research of cancer. The theories of Cohnheim, Ribbert, and Virchow are considered from the standpoint of the modern clinician, who can add to them the theory of the pre-cancerous condition.

At the present the thought that cancer may be produced by parasites has been laid aside. To produce a cancer a certain disposition for it must exist in the patient. It must be admitted that, although a tremendous amount of scientific work has been done, it is not known yet how a cancer cell originates from a normal cell. It seems that internal secretion can take part in this. Cancer resistance, the opposite side to disposition, is the power which does not permit healthy tissue to accept a transplanted cancer to grow. It may be influenced by change in living conditions, by disturbing the inner secretory functions, or by extraordinary physiologic conditions, such as pregnancy. The growing of human cancer tissue has not been very successful

yet. The treatment of cancer is surgical and radiologic, serum treatment having failed.

E. A. MAY, M.D.

Character and Cause of Cancer in the Light of Pathologic Anatomy and Experimental Pathology. A. Dietrich. *Strahlentherapie*, Dec. 12, 1931, XLII, 821-928.

This is a critical review of the outstanding accomplishments in the scientific search for the cause and nature of cancer. The recent work of Warburg dealing with the metabolism of the cancer cell is considered an important step in the right direction.

ERNST A. POHLE, M.D., Ph.D.

Metastases to the Bone from Cancer. Editorial. *Jour. Am. Med. Assn.*, Oct. 31, 1931, XCVII, 1304, 1305.

With the introduction of the roentgen ray, greater accuracy in studying the incidence of bony metastases in the skeleton became possible. Copeland combined the roentgenographic and microscopic study in his series. The bones in which metastases most frequently were found in carcinomas of the breast were the spine, pelvis, femur, skull, ribs, and humerus. There were two types of metastatic lesions shown by the X-rays, a destructive lesion and a bone-forming process. Bloodgood has differentiated multiple myeloma by the punched-out areas of destruction. Bence-Jones bodies in the urine favor the diagnosis of multiple myeloma. A single focus occurred in only one-fourth of the cases and the majority of these were in the vertebrae or femur. Treated by the roentgen ray, patients may expect relief from pain and often a few months of comparatively comfortable living. In hypernephroma little attempt at the formation of new bone within the area of destruction was found. Irradiation alone offers as much for the prolongation of life as does surgical intervention alone or surgery combined with radiation. Osseous lesions in cancer of the prostate were most frequent in the pelvic bones, vertebrae, and femur. Roentgenograms showed the lesion to be of an osteoplastic nature with a marked increase in the formation of bone. Malignant disease of the testicle, carcinoma of the uterus, ovarian malignant disease, carcinoma of the stomach, carcinoma of the lung, and melanoma showing metastases to bone are analyzed. Copeland found evidence indicating that both an embolic and a lymphatic mode of involvement occurred.

CHARLES G. SUTHERLAND, M.D.

Early Symptoms of Cancer. P. Morawitz and R.

Schatzki. *Strahlentherapie*, Dec. 12, 1931, XLII, 821-839.

This most interesting general review does not lend itself to abstracting since it covers such a wide subject. The ripe personal experience of the authors manifests itself throughout the article and many illustrative cases are quoted to support their standpoint. It is almost pathetic that they have to reach the conclusions: "It is not the inadequacy of our diagnostic facilities that prevents us from improving our present results in the treatment of cancer but the sad fact that there are no marked early symptoms of cancer, except in very rare instances."

ERNST A. POHLE, M.D., Ph.D.

Sexual Physiologic Studies: Hypophysis and Malignancy. M. Borst, A. Döderlein, and D. Gostimirovic. *München. med. Wchnschr.*, Dec. 11, 1931, LXXVIII, 2108-2113.

This article concerns the behavior and clinical value of the excretion of prolactin in women radiated for cancer of the genital organs. Prolactin is the sex hormone of the anterior lobe of the hypophyseal gland. In cancer cases, especially those of the female genital organs, the excretion of prolactin is increased, but the hormone is evidently produced in the anterior part of the hypophysis and not in the cancer tissue.

In cancer of the female genitalia, prolactin is found in the urine in 63.16 per cent. This figure increases after the first radiation and reaches 100 per cent after the second one. Even after an interval of six years, prolactin may be found in 50 per cent of the cured cases.

ERNST A. MAY, M.D.

A Clinical Study of Etiology of Gastric and Esophageal Carcinoma. Lloyd F. Craver. *Am. Jour. Cancer*, January, 1932, XVI, 68-102.

The author investigates in detail histories personally obtained from 36 patients with cancer of the stomach and 18 patients showing cancer of the esophagus. There were no control cases, however.

He concludes that there is a definite difference between the predominant etiologic factors in carcinoma of the stomach and carcinoma of the esophagus. In the former, poor teeth, lack of teeth, gastro-intestinal diseases, heat of ingested food and drink, irregularity of meals, lack of water, seasoning, cathartic drugs, rapid eating, tobacco, and alcohol seem to have some importance in the order named.

In the case of cancer of the esophagus the following factors seem important in the order named: tobacco, alcohol, lack of water, poor teeth, lack of teeth, and cathartic drugs.

JOHN R. CARTY, M.D.

CANCER (THERAPY)

The Degeneration of the Chemistry of the Cancer Cell. S. Edlbacher. *Strahlentherapie*, Dec. 12, 1931, XLII, 929-938.

Following a discussion of the recent advances in our knowledge of the chemical processes in the cancer cell, the author comes to the conclusion that the solution of the cancer problem may be found by further research in metabolism.

ERNST A. POHLE, M.D., Ph.D.

The Organization of the Fight against Cancer. Ferdinand Blumenthal. *Strahlentherapie*, Dec. 12, 1931, XLII, 809-820.

This article has been written as an introduction to the volume dedicated to the Samariterhaus (Heidelberg) on its twenty-fifth anniversary. In this institute R. Werner has carried out his well recognized work on cancer. The author outlines in detail all problems involved in the organization of the fight against cancer. He emphasizes the advantage resulting from the connection of tumor clinics with universities. No hard and fast rules can be given at the present time; only one fact stands out: Without the full co-operation of the profession at large the cancer problem cannot be solved.

ERNST A. POHLE, M.D., Ph.D.

Radiotherapy in Carcinoma of the Cervix Uteri. Hermann Wintz. *München. med. Wchnschr.*, Nov. 13, 1931, LXXVIII, 1935-1937.

Radiotherapy has shown excellent results in the treatment of cancer of the portio. Even in cancer of the corpus the results of radiotherapy are equal to those of operation. However, the results in adenocarcinoma of the cervix are still poor. Unfortunately, there are no statistics about the results of surgery. While the anatomic arrangement of the lymphatics leading to the portio and corpus is such that the disease remains localized for a long time, cancer of the cervix almost always spreads early into the parametria. Döderlein and others have proven that the cancer has already infiltrated the parametria long before the infiltration can be palpated.

Between January, 1916, and July, 1926, 32 cases of true carcinoma of the cervix were treated by the author. Of these, 15, or 47 per cent, are cured. In 25 of the cases an additional intra-uterine application of radium was given, besides the typical roentgen treatment of Seitz and Wintz. As the adenocarcinoma of the cervix is from 20 to 25 per cent less radiosensitive than the basal-cell carcinoma of the portio, the total dose has to be increased to 125

per cent, or 1,000 r units. The entire dose must be applied within three days. This will be followed by a severe reaction, with tenesmus and bloody stools. The increase in dosage from 110 to 125 per cent has brought about results which are at least equal to those of surgery. Both types of carcinoma are equal as to their radiosensitivity. However, the early spreading of the cancer in cervix cases will lower the five-year results considerably.

In conclusion, radiotherapy is to be given preference in the treatment of adenocarcinoma of the cervix. Radiation will reach the distant metastases in the lower pelvis much better than the knife.

E. A. MAY, M.D.

The Importance of Surgical Treatment in the Fight against Cancer. H. v. Haberer. *Strahlentherapie*, Dec. 12, 1931, XLII, 840-857.

The well-known surgeon, who now holds the chair of Surgery at the University of Cologne, offers a very interesting account of his own impressions concerning the rôle of surgery in the treatment of malignant diseases. He emphasizes throughout the article the importance of early diagnosis. Among 10,035 major operations of his own, 1,277 were for malignant disease and less than 50 per cent of the latter could be operated on radically. All others could be treated only palliatively.

The author is rather skeptical about the value of pre- and post-operative irradiation in cancer of the breast. However, he admits the splendid results of irradiation in certain cases and stresses the importance of co-operation between surgeon and radiologist. In his opinion, the high mortality of major and difficult operations, as, for instance, in cancer of the sigmoid, is justified because without assuming this risk 100 per cent of the patients would die.

ERNST A. POHLE, M.D., Ph.D.

Methods and Results of the Fight against Cancer in Gynecology. Robert Schröder. *Strahlentherapie*, Dec. 12, 1931, XLII, 858-869.

This is a general discussion of the treatment of gynecologic cancer. In his own clinic the author observed, between the years 1923 and 1930, 585 patients with cancer of the cervix, 64 patients with cancer of the fundus, 62 with cancer of the ovaries, 30 with cancer of the vagina, and 97 with cancer of the vulva. About 68 per cent of carcinomas of the cervix occurred between the ages of 35 and 55 years. Definite relations between the histologic picture of the growth and prognosis could not be established in his cases.

Early diagnosis and treatment are of paramount importance. The mortality of Wertheim's operation

in his 176 cases amounted to 19 per cent, with a five-year cure of 40 per cent. Radium has become a strong competitor of surgery. From 60 to 100 mg. of radium, heavily filtered, are placed near the tumor, and $3 \times 2,000$ mg.-hr. at 8-, 14-, and 21-day intervals are applied. The five-year cure reaches from 35 to 40 per cent, but one must not forget that about 10 per cent of the inoperable cases can also be saved. The value of radiation therapy is further clearly demonstrated in the treatment of recurrences following operation.

ERNST A. POHLE, M.D., Ph.D.

Cancer Therapy in Gynecology. F. von Mikulicz-Radecki. München. med. Wehnschr., Nov. 20, 1931, LXXVIII, 1993-1999.

The modern fight against cancer consists of three stages: The early discovery and proper diagnosis of the case; the actual treatment, and the after-treatment and after-care of the patient. The results in cancer therapy depend at present mostly on the early diagnosis.

In Germany, several districts have already made remarkable progress in propaganda and instruction of the population, especially physicians, as to the early signs of cancer. Every woman suffering from hemorrhages must be examined by palpation and inspection. Every suspicious condition must be considered as being possibly carcinomatous. A section should not be made by the practitioner but by the specialist who is to treat the case afterward. Rational treatment should follow the section immediately. Absolutely condemned are any such incomplete measures as scraping out the crater of the portio, amputation of a cauliflower tumor, simple vaginal extirpation of the uterus in carcinoma of the cervix, electrocoagulation of a cervical carcinoma alone, or simple excision of a cancer of the vulva or urethra. All these measures are only palliative, not radical, and darken the outlook of further radical treatment and ultimate cure.

The problem is more serious than any statistics show, as a high percentage of the cases do not enter a hospital and are not reported. The author requests that cancer patients be referred to special institutions, which are fully equipped to take care of them. Since statistics have proven that radiotherapy in the treatment of female genital cancer is at least equal to operation, most of the cases receive radiotherapy, for the inoperable ones can also be treated with a chance of cure. However, there are those who advocate the combination therapy. The operable patients receive a pre-operative radium or roentgen treatment, which may reduce the size and extension of the growth. This is followed by radical operation. After the patient has sufficiently recovered, post-operative roentgen treatment is given.

Another method is the so-called selective therapy. Since only cases which are very good operative risks

undergo operation, every one with mild or severe complications from the heart, lungs, kidneys, thyroid, etc., is referred for radiation. This reduces the operative mortality and thus increases the relative number of cures. Cases which six weeks after radiation do not show a good improvement are also subjected to operation.

A further method is to select the cases from the histologic viewpoint; however, this is still very difficult. In cancer of the neck of the cervix the operative method shows an absolute cure of 19, or 1 per cent, and a relative cure of 35, or 6 per cent. The comparative results in radiotherapy are 17, or 4 per cent, and 42, or 7 per cent, in operative and borderline cases, and 11, or 1 per cent, in inoperable cases. The combination treatment at the Berlin clinic shows an absolute cure in 36 per cent and a relative cure of 49, or 2 per cent, in operable and 16 per cent in inoperable cases. All cases of Group 1 of Döderlein, also all early adenocarcinomas, are operated on, except those with even light contra-indications. Also, all cases below 35 years of age are radiated. If six weeks after radiation these cases do not show marked improvement, an operation is indicated. The method of operation is the vaginal radical operation as developed by Stoeckel. Cases of Groups 2 and 3 receive first an intra-uterine and intravaginal radium dose of from 2,500 to 3,000 milligram-hours. If after six weeks the cancer appears to be operable, operation is performed; if not, a second radium application plus a course of X-ray treatments are given with 100 per cent over the entire lower pelvis. All cases operated on receive prophylactic X-ray treatment.

Cauterization or electrocoagulation of a cancer of the cervix is to be avoided, as a beneficial action has never been seen and the cancer cells left behind seem to be more virulent than before.

In cancer of the corpus uteri, the results are better than in cancer of the cervix. Here the ratio of the collective statistics among the methods of operation, radiotherapy, and the combination of the two in absolute cures is, respectively, 42, or 8 per cent, 42, or 7 per cent (Wintz), and 48, or 1 per cent. This again shows the superiority of the combination method.

As in cancer of the vagina both methods give poor results, the author suggests surgery and post-operative treatments in operable cases. The same holds true in cancer of the vulva. In cancer of the urethra, radium is to be preferred to operation, perhaps combined with extirpation of the inguinal glands, radiation to follow. Cancer of the tubes is very rare and is diagnosed only at operation. The method of total extirpation and post-operative radiation is recommended. Most cases of cancer of the ovaries come under medical observation after having reached an inoperable condition. Still operable and borderline cases should be operated on and radiated

afterward. The treatment should cover the entire lower abdomen.

The after-care of cancer cases consists of the restitution of the patients to health, so that they are able to work. Every case must be followed up and examined at regular intervals. Recurrent cases should receive only radiation. Hopeless cases should receive relief from pain and suffering as much as is possible.

E. A. MAY, M.D.

CHEST (DIAGNOSIS)

Case Reports of Congenital and Acquired Bronchiectases (Cystic Lungs). Thomas Canigiani. *Röntgenpraxis*, Dec. 15, 1931, III, 1116-1120.

The pathologists have described cysts and cavities of the lungs rather frequently as congenital anomalies. Clinical and roentgenologic observations have not been made very often during the life of the patient. Three such cases are described in detail.

Clinically, chronic tuberculosis is usually suspected. Roentgenologically, it seems impossible to distinguish between congenital and acquired bronchiectases, the history in such cases being of great importance. If there is no lung structure within the cyst, one may suspect a congenital anomaly. The differential diagnosis from echinococcal cysts is not often required.

H. W. HEFKE, M.D.

Latent and Transient Exudative Serosities as the Cause of Cryptotuberculous Fever. Collatino Cantieri. *Riv. di Patol. e Clin. della Tuberculosis*, November, 1931, V, 990-992.

The concept of exudative pleuritis or peritonitis is generally that of a disease with a long course, whether of more or less acute nature or of slow and disguised form.

The author demonstrates the existence of certain exudative tuberculous serosities, as the anatomic basis of a febrile process, for a time cryptogenetic, which have as a characteristic a marked lack of physical and general signs and a particularly short course, hence a very rapid reabsorption of the exudation. There is no pain, no subjective disturbance which might direct attention to the thorax or the abdomen, in both of which all signs of a strong effusion are lacking.

These morbid manifestations, however, possess a great practical significance as indicative of tuberculous infection. Study of the case calls for explorative puncture, but with an especially fine and delicate technic, since we are dealing with a liquid through which the point of the needle may easily pass unnoticed, unless the hand is highly skilled.

Roentgenologic examination is unable to tell us anything in certain cases, a few days after an explorative puncture of the thorax, with positive findings and with a liquid directly inflammatory. It re-

veals to us the pleura completely free, the diaphragm mobile, no trace remaining of the morbid process evolved in that region.

W. W. WHITELOCK, Ph.D.

Case Reports of Free Fibrin Balls (Blood Fibrin Balls) in the Pleural Cavity. Georg Grundner. *Röntgenpraxis*, Jan. 1, 1932, IV, 36-40.

The author has been able to find 19 cases of free fibrin bodies in the literature. He reports two new cases. The general opinion is that these balls originate from fibrin, which comes from the exudate or from blood, by the thoracic paracentesis. It was possible in one of these cases to remove these bodies from the pleural cavity during a thoracotomy for an empyema. The histologic examination in this case showed the presence of fibrin, which must have originated from blood. Introduction of a needle in the thorax should, therefore, be done very carefully.

H. W. HEFKE, M.D.

A Review of Pneumoconiosis: Further Roentgenological and Pathological Studies. Henry K. Pancoast and Eugene P. Pendergrass. *Am. Jour. Roentgenol. and Rad. Ther.*, October, 1931, XXVI, 556-614.

Pneumoconiosis must now be looked on as a more or less necessary risk in the progress of civilization. Since the roentgenologic examination is the most accurate and satisfactory method of detecting it from the earliest to the most advanced stages, it is essential that roentgenologists be familiar with all phases of the disease.

The continuance of the term "pneumoconiosis" is advocated, for while silica is usually the active fibrosing agent, other agents are capable of directly causing fibrosis. Others, such as coal and clay dust, tend to retard the action of silica, while some alkalies may enhance its action. Certain very unusual features in the fibrosis occurring in asbestos workers have caused the term "pulmonary asbestosis" to be widely used.

It has not yet been established as to just how much silica dust is necessary in the lungs in order to produce actual silicosis; however, investigations by the U. S. Public Health Service have shown that 10,000,000 particles containing about 35 per cent free silica per cubic foot of air could be tolerated over a long period without great injury to the lungs.

Concerning pathology, the consensus of opinion is still in favor of the "dust cells" being of endothelial origin and being derived from the walls of the capillaries and lymphatics, which are in intimate relationship with the alveolar epithelium. From the alveoli these "dust cells" migrate to the lymphoid deposits, pass then to the larger lymphoid deposits, and then to the pulmonary lymph nodes, some being stopped at each of these way-stations along the

route of pulmonary lymphatic drainage and producing lymphatic obstruction and subsequent fibrosis.

More recent views on the termination of the dust cells are that at some point or another these cells die and liberate their silica particles, the liberated silica being the important factor in producing the end-result of fibrosis. At certain points along the lymphatic channels there may be sufficient clogging, so that some of the cells break through the walls of the blocked vessels and set up a fibrosis reaction in the interstitial lung tissues. With blockage of the hilum-ward lymph flow, a backflow toward the subpleural lymphatics takes place, resulting in peripheral nodulation and thickening of the pleura and adhesions. While, theoretically, removal of the dust hazards from an individual developing pneumoconiosis should be followed by a certain amount of clearing of the lung by elimination of some of the dust particles from the pulmonary lymphatics, the authors believe that once established silicosis is progressive, and any improvement following cessation of dusty work is apparent rather than real. All extensive studies of silicosis show that workers who develop the condition with any degree of rapidity are predisposed to respiratory infections, especially bronchitis, pneumonia, and tuberculosis. Tuberculosis affects particularly those in whom silicosis develops most rapidly; hence it can be controlled to a certain extent by measures directed against the rapid development of silicosis.

Spontaneous pneumothorax is a not infrequent accident in the course of the development of pneumoconiosis and is almost always in the upper lobe. Pleural effusion, as a direct complication in the course of pneumoconiosis, has never been encountered by these writers.

Roentgenologic studies to be complete must include both roentgenoscopy and stereoscopic roentgenography, the former procedure being especially important in determining respiratory capacity. The commonly used roentgenologic classification of involvement is first, second, and third stage. The first stage, which, in the belief of the writers, should have no definite medico-legal status for awarding compensation, shows a definite increase in the prominence and extent of the hilar shadows, increased prominence and thickening of the trunk shadows, and greater prominence of the linear markings of the peripheral zone. It is emphasized that this appearance is not characteristic of pneumoconiosis but may be simulated by passive congestion, acute or chronic respiratory infections, chronic, bronchial catarrh, and bronchiectasis.

The second stage, which is the most characteristic of the three, is indicated roentgenographically by the presence of small rounded densities, varying in size from a pin head to a pea, distributed throughout both lungs but most numerous about the lung roots and least frequent in the apical regions and

bases. Theoretically, these appearances should be superimposed upon the first stage appearances, but often the latter are absent, either being obscured by emphysema or being in some measure resolved, if peripheral lymph block occurred early.

The third stage of the disease shows a diffuse fibrosis predominating, which may be in the form of large coalescing nodules, more or less diffuse fibrosis, or massive fibrotic areas resembling extensive consolidations. Diaphragmatic excursions are usually greatly restricted or absent.

The writers believe that the time has come for the adoption of a more satisfactory classification of this disease process on a pathologic basis which will include the typical and the variants and be applicable to both clinical and roentgenologic studies for all industries and occupations. Their classification is in five groups as follows:

- (1) Peribronchial-perivascular-lymph node predominance
 - (a) rapid
 - (b) slow
- (2) Early interstitial predominance (interference with diaphragmatic movement)
 - (a) with nodular appearance
 - (b) without nodular appearance
 - (c) rapid or slow
- (3) Late or advanced interstitial predominance
- (4) Nodular predominance
 - (a) non-progressive
 - (b) progressive
- (5) Advanced diffuse or terminal fibrosis
 - (a) conglomerate nodular type
 - (b) interstitial type
 - (c) massive fibrosis type

In the latter part of the article certain dusty industries are considered individually, those included being coal mining, the asbestos industry, the abrasive industry, hard rock mining, the sandstone industry, the granite industry, the slate industry, iron mining, the cement industry, and vitreous enamel painting. Particular attention is given to the asbestos hazard and to the roentgenologic appearances of what has been termed "asbestosis."

The harmful products of the asbestos factories are almost entirely silicates, chiefly hydrate magnesium silicate. "Asbestos bodies" occurring in a number of different forms and found on necropsy examination in the lungs of patients dying of asbestosis, are one of the most remarkable features of this form of pneumoconiosis. The most characteristic form is found in the alveoli and bronchioles and in fibrous and necrotic areas. They are from 20 to 100 microns in length and are often dumb-bell shaped. They are golden yellow or brownish in color. Theories as to the nature of these bodies are that they are osmotic silica infarcts, particles of ferruginous quartz, or some colloidal product of the original as-

bestos particles. At any rate they are considered absolutely characteristic of pulmonary asbestosis.

Roentgenographically, the findings, while rather unusual, cannot be considered characteristic. In several groups of cases studied the evidence of fibrosis was found first on the left side, although other workers have not confirmed this finding. Characteristically, the interstitial fibrosis seems predominant and often one is apt to underestimate the degree of disability unless careful roentgenoscopic observations are made which may demonstrate a surprising degree of restriction. Even in the later stages the interstitial fibrosis may predominate. Without adequate protection the prognosis is considered grave, although no definite tendency to susceptibility to tuberculosis in the presence of asbestosis has been yet established.

J. E. HABBE, M.D.

Some Forms of Chronic Bronchitis. Mariano R. Castex. *La Prensa Méd. Argentina*, Dec. 10, 1931, XVIII, 879-887.

Though the knowledge on this subject is familiar to everyone, it is of great importance because of its common occurrence and also because of its complications, such as bronchiectasis, pulmonary emphysema, fibrosclerosis, adenocellulitis of the mediastinum, myocardial insufficiency, etc. The microbiologic study often reveals the causative bacteria, and thus the successful treatment is instituted. Some cases are due to amebiasis, and emetine promptly cures them. Others are due to infections of the tonsils and disappear after their removal. A third type of chronic bronchitis is due to infection of the maxillary sinuses.

The author presents four cases, together with their corresponding radiographs, which showed improvement following a maxillary sinus drainage. Other factors relating to the etiology are familial tendencies, the influence of certain diseases, such as syphilis, tuberculosis and gastro-intestinal disturbances, and the absence of Vitamin A in the diet.

N. G. GONZALEZ, M.D.

Bronchoscopy as an Aid in the Diagnosis of Obscure Pulmonary Disorders. Edward A. Looper. *Jour. Am. Med. Assn.*, Oct. 31, 1931, XCVII, 1287-1291.

The present trend of the bronchoscopic art is to bring additional help to the internist in the investigation of the larynx, trachea, and bronchial tree. The surgeon can often obtain much helpful information from endoscopic examinations. In lung abscess, co-operation between bronchoscopist and surgeon will insure the best results. In various parts of the country a great opportunity exists for bronchoscopic investigations in sanatoriums; special clinics are suggested to take advantage of this opportunity. In chronic cases the decision of some

unrecognized or complicating condition may rest largely on bronchoscopic examination.

Bronchoscopic examination may reveal a local cause for repeated attacks of hemoptysis. Used with iodized oil injection or pneumography, it is also helpful in outlining lung abscesses, atelectasis, new-growths, and bronchial stenosis. A series of cases are reviewed to show the application of the above mentioned points.

CHARLES G. SUTHERLAND, M.D.

Advantages of Intubation Method of Introducing Iodized Oil for Bronchography in Children. Samuel Iglauer. *Jour. Am. Med. Assn.*, Nov. 21, 1931, XCVII, 1517-1521.

Bronchography should be employed more frequently in children, for many chronic pulmonary diseases, particularly bronchitis, pneumonitis, bronchiectasis, and lung abscess very often originate during the early years of life. It is contra-indicated in the presence of high fever, dyspnea, or recent hemoptysis, in cardiac decompensation, and in cachectic individuals.

In the intubation method a modified, all-metal O'Dwyer intubation tube is used. The modification consists in the addition of a second small bore tube soldered into a longitudinal groove in the posterior wall of the original intubation tube, thus creating a double-barreled tube, with one channel to provide for breathing and a second channel to convey the oil. The intubation tube is introduced by touch.

To obtund the cough reflex about 4 c.c. of a procaine solution is slowly injected through the rubber tubing into the trachea and bronchi. With the patient in the upright position behind a fluoroscopic screen, iodized poppy-seed oil, 40 per cent (lipiodol), is injected under fluoroscopic control. The injection of any alveoli should be avoided. From 10 to 20 c.c. is usually sufficient. It is advisable not to remove the intubation tube before the roentgenograms are made, as the extraction of the tube excites a cough reflex which tends to scatter the oil within the lungs.

CHARLES G. SUTHERLAND, M.D.

CHEST (GENERAL)

The Bronchial Bifurcation in Mitral Lesions. C. Donovan, A. Battro, and Gazotti. *La Prensa Méd. Argentina*, Dec. 10, 1931, XVIII, 905-913.

The authors begin their paper by giving the normal anatomy of the bronchi and emphasize the fact that the right bronchus runs vertically while the left one runs horizontally. Due to the relation of the left bronchus to the left auricle, anything affecting the size of the latter is going to affect the direction of the former. Mitral stenosis and mitral insufficiency provoke a dilatation of the left auricle. Several authors, such as Vaquez and Bordet, Steel,

Paterson, Gäbert, and others have studied the radiologic changes of mitral stenosis.

The authors go into detail in regard to the changes in mitral stenosis, particularly in reference to the exaggerated aperture of the bronchial bifurcation. They conclude their paper by presenting a chart of fourteen cases, with the diagnoses, angle of bronchial divergence, and deformity of esophagus.

N. G. GONZALEZ, M.D.

Pulmonary Conditions under Strain (Certain Radiologic Modifications in the Lungs of Athletes in Breathing Pauses before, during, and after the Strain). Gioacchino Arnone. Riv. di Patol. e Clin. della Tuberculosis, Jan. 31, 1932, VI, 57, 58.

This report is in response to a resolution of the Italian Fascist Society for Scientific Study of Tuberculosis drawn up at its session of May 29, 1931, calling for extension of the system of individual charts of the respiratory system, not alone to school-children and workmen, but also to those engaged in sports, for prophylactic, eugenic, and medico-legal purposes. The report was made at the session of the Society at Palermo, on July 10, 1931.

On the basis of radiograms made in breathing pauses in the case of individuals engaged in various sports, and studied in conjunction with the cardiac tonus before, during, and after the strain, the following conclusions were reached.

Shadow of the Hilus.—This is seen to be fuller and more extended than normal in repose. During the strain it is more ample, and its tissue stands out more clearly, owing to the greater transparency of the lung. After the strain, the return to normal occurs within from 7 to 40 minutes, according to the degree of relaxation and to heart conditions.

Pulmonary Trauma.—During repose it is clearly evident in the median zone, becoming more so during the strain, owing to the clearing up of the pulmonary field. The trabeculae are more distinctly visible, being more separated, owing to greater aëration of the lungs. After the strain the trauma is compact, as in repose.

Nodular Shadows.—In repose, these are very numerous, both on the right and left, in the lung as well as in the hilus, so as to simulate a lymphatic tuberculosis with numerous nodules of infiltration of the median pulmonary regions. During the strain some of the nodules are less evident or even imperceptible; others are more evident, either because enlarged and denser, or owing to the greater aëration of the lung. After the strain the shadows become as during repose.

The nodular shadows are of two kinds: (1) Nodular shadows of irregular outline scattered in the pulmonary field and in proximity to the hilus, which disappear or become modified during the strain; (2) nodular shadows of regular outline, in-

tensely opaque, often accompanied by ring-shaped shadows of approximately the same caliber, which increase in volume during the strain. The former are due to circumscribed vascular ectasia, or to crossing of vessels; the latter are due to infiltrated vessels.

One of the nodular shadows, accompanied by the shadow of the bronchus, on being examined and measured, was seen to increase during the strain by 1.5 mm. in vascular caliber and by 2 mm. in bronchial caliber.

Explanation of the data placed in evidence is closely connected with study of the heart and vessels, of their tonus and normal function during the strain.

Limiting ourselves for the moment to the radiologic observation of respiration of the lung, it may be stated that in the lung of the athlete during a pause in the period of strain there appear shadows of the hilus and lung, due to a vascular network more vigorous than under normal conditions, in a state of functional equilibrium.

W. W. WHITELOCK, Ph.D.

The Postpneumonic Lung: A Critical Review. Alan L. Hart. Am. Jour. Roentgenol. and Rad. Ther., September, 1931, XXVI, 371-396.

Following an acute pneumonic process, any one of three conditions may occur: Absorption of exudate, with return to normal of lung tissue; organization of exudate, with fibrosis and development of non-tuberculous infections; suppuration, with possible abscess formation or other sequelae. Such pneumonias as the influenzal, with or without streptococcic invasion (Friedländer's), and the bronchopneumonias following measles and pertussis, in which the connective tissue framework of the lung, the walls of the bronchial tree, and blood and lymph vessels are most seriously damaged, are most prone to chronic lung changes. The resulting fibrosis, if diffuse, may cause considerable impairment of function. Serial roentgenologic studies afford the best means of following the course of these chronic lung changes when resolution does not take place promptly.

An excellent chart, giving briefly the gross and microscopic pathology in the various component parts of the lung, with frequency of development of suppuration in the lobar and several types of bronchopneumonias, is a valuable aid to roentgenologists. It enables them to interpret the roentgen changes in terms of pathology in those cases in which prompt and complete resolution fails to occur.

J. E. HABBE, M.D.

Siderosis of the Lungs. N. A. Podkaminsky. Röntgenpraxis, Dec. 1, 1931, III, 1071-1084.

The dust from iron contains mainly either iron or silica in different combinations. The inhalation

of dust containing iron particles even in great quantities does not apparently lead to any pathologic changes in the lung tissue, except to cause a pigmentation. It is the presence of the silica in the dust which produces fibrosis. The *modus* of invasion and the pathologic sequences produced by the entrance of silica-dust into the lungs are described. The anatomic and clinical pictures and roentgenograms were thoroughly investigated.

The author examined roentgenologically 140 men who were employed as workers in iron mines in the Ukraine. They were all drillers, and the dust content of the air was high (from 12,000 to 13,000 dust particles per cubic centimeter). Eighty-two of the 140 men were found to have a fibrosis in the first stage (their average working time had been 15.1 years); 40 were found to have a fibrosis of the second stage (their average working time was 18.2 years). A third-stage fibrosis could be found only among some who had been invalids and were no longer employed. Four such men had worked for an average of 35.7 years.

The roentgenologic appearance of the silicosiderosis cannot be differentiated from the pure silicosis. The fibrosis must be explained by the action of silica; the iron might even give a certain amount of protection. Three types of lung siderosis must be distinguished: (1) Siderosis of metal grinders (silico-siderosis gravis), (2) siderosis of workers in iron mines (silico-siderosis levis), (3) siderosis of glass polishers (siderosis pura or chromatica).

H. W. HEFKE, M.D.

Yeast Infection of the Lungs. T. R. Healy and L. B. Morrison. *Am. Jour. Roentgenol. and Rad. Ther.*, September, 1931, XXVI, 408-413.

Fungi may attack any organ or system of the body and are most common in the integumentary system, while the nervous system is least frequently involved. The exact mode of development of the infection in the human being is not certain, although, undoubtedly, breaks in the skin favor entry. In other cases, inhalation of dust containing the mold may be the portal of entry. Since the geographic distribution of these fungi is wide, yet the frequency of the disease is not great, it is reasonable to assume that man possesses a considerable degree of natural immunity.

Symptoms of fungus infection in the lungs may vary from that of mild bronchitis to that of advanced phthisis. Cases may go on to spontaneous cure or terminate fatally. The diagnostic triad of absence of tubercle bacilli in the sputum, apparent discrepancy between the roentgen evidence of extensive disease and the clinical appearance of fair health, and of the presence of yeast cells in the sputum is stressed by the writers. Five cases are reported, all showing *Blastomyces imperfecti* in the

sputum, and are illustrated with the chest roentgenogram of each.

J. E. HABBE, M.D.

CHEST (THERAPY)

Treatment of Cavities in the Vertex of the Lung by Apicolysis and Packing. Alejandro J. Pavlovsky and Antonio A. Cetrángolo. *La Prensa Méd. Argentina*, Jan. 10, 1932, XVIII, 1049-1068.

Recently in Central Europe there have been many articles on this subject. The authors state that since about 5 per cent of pulmonary tuberculosis cases are surgical, this treatment ought to be applied to a selected number of those cases. They review the literature and state that the poor results obtained with this method were finally overcome by the use of a special mixture of paraffin first introduced by Baer, in 1913. The authors believe that the ideal indication for such a procedure is a cavity process of long standing, well limited, the rest of the lung being normal, and the other lung uninvolved.

All the cases on which the authors have practised this treatment have had the following: (1) General dietetic, hygienic, and climatic therapy; (2) sanocrysin; (3) unsuccessful attempts at pneumothorax, and (4) phrenicectomy. The authors explain why this treatment is more agreeable and more successful than thoracoplasty. Their method consists of a posterior incision, resection of 3 cm. of the third rib, freeing of the parietal pleura, breaking all the adhesions, and packing with Baer's paraffin mixture, following which the wound is closed.

They conclude their article by presenting eight cases with complete radiographs before and after operation. Judging by the histories of those eight cases, their main difficulty is in introducing enough Baer's paraffin mixture.

N. G. GONZALEZ, M.D.

CIRCULATORY DISTURBANCES

Bleeding of Benign Origin. Leo Kessel. *Jour. Am. Med. Assn.*, Oct. 10, 1931, XCVII, 1058-1060.

Acute bleeding arouses at least three grave suspicions: a blood dyscrasia, the ulceration of a malignant neoplasm, or a chronic inflammatory process, particularly tuberculosis.

This report of a series of interesting cases deals with a group of patients in whom serious organic disease was excluded, yet presenting a history of hemorrhage. Bronchoscopy revealed in one a plexus of dilated veins at the base of the tongue; in another a broncholith, with a piece of nut shell as a kernel, filled the right lower bronchus with a mass of granulation tissue which bled easily. Lupus of the trachea was the cause of another hemoptysis of three years' duration. Benign tumors of the bronchus accounted for two, and multiple telangiectasis

involving the nose, tongue, and lips accounted for another. In one case laryngoscopy revealed a cavernous angioma in the left vocal cord, while in another melena resulted from a small nevus in the anal ring; again, it was associated with a rash over the hands and back, typical of erythema nodosum.

In discussing this paper, Smithies stressed bleeding related to the menstrual cycle or menopause. He mentioned occupations in close relationship with some of the volatile hydrocarbons, leading to saturation of the blood to a degree adequate to produce laking in the vessels followed by seepage from the capillary bed.

CHARLES G. SUTHERLAND, M.D.

CONTRAST MEDIA

Hepatosplenography. Hans L. Popper and Erwin Klein. *München. med. Wchnschr.*, Oct. 23, 1931, LXXVIII, 1829, 1830.

The visualization of liver and spleen by the X-ray is of great aid to the clinician. Radt and Oka have accomplished this by intravenous injection of a colloidal thorium preparation. The authors have tried thorium dioxide on fourteen cases with good results: One of them was a large tumor of the liver, which could be seen on the film as a large defect. The preparation, which is called thorotrast, has no direct ill effects, even in large doses. It is very slightly radio-active. From 60 to 90 c.c. are injected. The best concentration in liver and spleen can be seen after from three to five days. However, in some of the cases, as well as in animal experiments, the dye could be found after seven months deposited in the spleen and liver at the same concentration. It is, therefore, to be used with the greatest precaution until further research proves the method to be harmless.

E. A. MAY, M.D.

Intratracheal Injection of Lipiodol. Raul F. Vaccarezza. *La Prensa Méd. Argentina*, Nov. 20, 1931, XVIII, 798-802.

The author gives a short outline of the methods used for visualization of the bronchial tubes with lipiodol, and his objections to those methods. He then introduces his method, which consists of the suppression of the swallowing reflex by means of anesthesia of the pharynx with 5 per cent cocaine chlorohydrate by spray. The patient is placed in abdominal decubitus and the lipiodol is placed at the base of the tongue. The amount of lipiodol used is usually 20 cubic centimeters. The results obtained have been excellent. Several radiographs are presented.

N. G. GONZALEZ, M.D.

Some Experiments in Rectal Pyelography. Knut

Wolke. *Acta Radiologica*, 1931, XII, No. 69, 497-515.

The author compares the absorption efficiency of uroselectan and abrodil (skiodan), the latter being preferred and used in a group of 37 cases. Preparation of the patient and administration of the dye were done in the following manner.

Fluids were withheld for the twelve hours preceding the examination. Two hours after the patient had received an ordinary enema, roentgenograms were made of the urinary tract, after which four suppositories, each containing five grams of skiodan, were inserted into the rectum. The patient was then kept in a sitting position (to prevent ascent of the dye into the upper colon) for forty-five minutes. A roentgenogram of the urinary tract was then made. If there was evidence of dye in the kidney or ureters, compression was applied at the level of the sacro-iliacs. The author repeatedly emphasizes the value of compression in all but retrograde pyelographic studies. A film was made about twenty-five minutes later and repeated every fifteen or thirty minutes, until results were satisfactory, or if no dye was noted two and one-half hours after administration, the procedure was stopped and a cleansing enema administered. Of 30 cases receiving 20 grams of skiodan, 18 showed good filling of one or both renal pelves. The formula of the suppository used by the author was as follows:

Skiodan	5	grams
Ext. belladonna	0.007	gram
Gelatini pulv.	2	grams
Aq. dest.	1	gram
Glycerini	0.40	gram

M. J. GEYMAN, M.D.

DIAPHRAGMATIC HERNIA

Absence of Half of the Diaphragm (Thoracic Stomach; Diaphragmatic Hernia). Edward L. Jenkinson. *Am. Jour. Roentgenol. and Rad. Ther.*, December, 1931, XXVI, 899-903.

A case of thoracic stomach is reported, the diagnosis being first established roentgenoscopically when the patient was 68 years old. He had had more or less gastric complaint in the nature of spitting up of food and difficulty in swallowing since the age of 32. Roentgenoscopically the esophagus was found to be only about three inches long and to enter the stomach at the level of the sternoclavicular articulation. The greater curvature of the stomach was to the right, the pylorus to the left, pointing downward. The duodenal bulb was just about at the level of the normal esophageal opening, the diaphragm, intact on both sides, and the stomach empty at five hours.

Three cases of congenital absence of half of the diaphragm are also reported. Two were seen in the

new-born, one being left-sided absence, with the left chest containing small bowel and a portion of the large intestine, and the other right-sided absence, also containing parts of the large and small intestines. Both cases died a few days after delivery and each showed postmortem findings confirming the roentgenologic diagnosis. The third case occurred in a child, six years of age, who showed absence of the left half of the diaphragm, the stomach and splenic flexure being located in the left chest. This patient was submitted to operation but died. All three cases complained or showed signs of respiratory embarrassment.

J. E. HABBE, M.D.

EXPERIMENTAL STUDIES

The Significance of Unspecific Immunity in Cancer Therapy. W. Caspari. *Strahlentherapie*, Dec. 12, 1931, XLII, 899-912.

The author gives in this paper a summary of his work published in a series of articles during the past 15 years and dealing chiefly with transplantation of tumors in mice and rats. He feels that the so-called specific immunity plays an important rôle in the treatment of carcinoma.

ERNST A. POHLE, M.D., Ph.D.

Attempts to Record Alpha-ray Spectra of Very Low Intensity. Georg Stetter and Roman Premm. *Sitzb. Akad. Wiss. Wien, Math.-naturw. Klasse, Abt. IIa*, 1931, CXL, 579-584.

The purpose of the experiments was to overcome the difficulties of getting α -ray and H -ray pictures on photographic plates, these difficulties being due to the extreme sensitiveness of the photographic plate to many other influences. First, a suitable chemical process was sought, but nothing was found which would record a single α -particle. Next, a biologic method was tried. Fungus spores were embedded in gelatin on a plate and exposed to α -rays. The germination of the spores was reduced by the rays, but the plates could be used for qualitative observations only, since the proportion of naturally sterile spores varied greatly from plate to plate, and also the time required for germination was very variable. Last, a method was developed with a photographic plate, whereby if the α -rays impinged at nearly grazing incidence, the straight blackened track made by a single α -particle in the film could be observed microscopically and distinguished from blackening due to other causes.

CHEMICAL ABSTRACTS.

Effects of Ultra-violet Rays, Radium, and X-rays on Proteins. M. Spiegel-Adolf. *Arch. Path.*, 1931, XII, 533-542.

Rays of short wave length produce effects on proteins that differ from the effects produced when

the protein solutions are heated to 100°. The reaction due to irradiation is irreversible. This criterion for differentiating between the two types of denaturation cannot be applied to proteins denatured in the presence of alkali, because, under these conditions, the heated protein also undergoes an irreversible change. Differences between alkaline solutions denatured by heat and those denatured by irradiation can, however, be detected easily with the aid of the quartz spectrograph or by determination of the dispersion quotients. Various types of rays, such as ultra-violet rays, X-rays, and Ra, produce effects on proteins that are qualitatively, though not quantitatively, similar. Coagulation of protein results from a few minutes of irradiation with the Hg arc, 3 hours' exposure to X-rays, and 9 hours' exposure to 80 mg. of Ra.

The principal absorption bands of the solutions of proteins lie in the ultra-violet region of the spectrum. A conversion of part of the energy of Ra and X-ray radiations into ultra-violet rays should intensify the effect of these radiations on protein. Certain crystals that fluoresce in the ultra-violet region when irradiated by Ra or X-rays were enclosed in quartz tubes and immersed in the protein solution. Whereas proteins irradiated by X-rays and Ra without ultra-violet fluorescence exhibit no changes, the same proteins similarly treated in the presence of the fluorescent material are coagulated. Similar results were obtained with red blood cells and paramecia, and experiments are being carried on with tumor tissue of mice.

CHEMICAL ABSTRACTS.

Transmission from Animal to Animal of the Fatal Toxic Disease Caused by the Filtrable Tuberculous Virus in the Guinea Pig Exposed to X-rays. M. Nasta, I. Jovin, and M. Blechmann. *Compt. rend. Soc. de biol.*, June 30, 1931, CVII, 849-851.

The authors were interested in determining whether the fatal toxemia resulting from inoculation of the filtrable tuberculous virus in the guinea pig exposed to X-rays could be transmitted. In order to prove that the transmitted disease was due to the tuberculous virus and not to a toxic property of the filtered products (urine, sputum, etc.), a series of guinea pigs were inoculated with a filtered tuberculous urine. Half the animals were submitted to X-rays. After each irradiation two irradiated animals and two non-irradiated, but all inoculated at the same time, were killed. The liver, spleen, kidneys, and lymph nodes of one of the animals were employed for inoculation to other guinea pigs, whereas the other served for microscopic examinations for tubercle bacilli and histologic survey of the organs.

The result of these experiments was that when transmissions were made with organs of animals inoculated with filtrable tuberculous virus, the ani-

mals to which these transmissions were made (afterwards exposed to X-rays), developed fatal toxic accidents, whether or not the animals from which the organs were obtained had been exposed to irradiation. This proves that the toxicity of the filtrated products was due to the presence of a virus and not to toxic properties of the pathologic products (urine, sputum) of the organs injected. In addition, the presence of tubercle bacilli in the inoculated animals was demonstrated.

HENRY BAYON, M.D.

Effects of Cod-liver Oil and Ultra-violet Irradiation, as Influenced by Oyster Shell, in the Diet of Confined Laying Hens. Walter A. Hendricks, Alfred R. Lee, and Albert B. Godfrey. *Jour. Agric. Research*, 1931, XLIII, 517-535.

Feeding cod-liver oil or administering ultra-violet irradiation to laying hens confined without access to direct sunlight or green feed increased egg production and the thickness of the egg shells and improved the general condition of the birds. Both of these vitamin supplements also indicated a tendency to increase egg weight and improve the hatchability of the eggs. Cod-liver oil was superior to 15 minutes daily administration of the type of ultra-violet irradiation used as a supplement to the basal diet. When no cod-liver oil was included in the diet the addition of oyster shell increased egg production and thickness of egg shell even though mineral supplement was present in the basal diet. Oyster shell thus appears to be a source of easily available mineral or to contain a small amount of some factor which is present in cod-liver oil.

CHEMICAL ABSTRACTS.

Microscopic Changes in the Internal Organs of Dogs after the Intravenous Injection of Tetraiodophenolphthalein. Vsev. Korkhoff and M. Olkhovskaya. *Vestnic Rentgenologii i Radiologii*, 1931, IX, 105.

Having observed that the intravenous injection of tetraiodophenolphthalein for gall-bladder examinations is often followed by various complications, the authors undertook a series of experimental investigations upon dogs. The experiments consisted in the intravenous injection of the dye in dogs and the microscopic examination of the tissues removed from the internal organs at various intervals after the dye injection. It was found that the sections of tissues removed from the animals a day after the injection showed definite abnormal changes, these changes being greater in the liver cells and bile ducts than in any of the other organs examined. Sections of tissues removed at later dates after the injection failed to show any abnormal changes.

The authors are of the opinion that some of the clinical reactions observed in human beings after the intravenous injection of the dye are due to the

abnormal changes which have taken place in the liver. They also believe that the more serious disturbances after the injection of the dye may be due also to impaired tissues in the liver as a result of some previous disease of the liver.

SAMUEL BROWN, M.D.

The Prevention of Experimental Duodenal Ulcer by Feeding Neutral Gastric Mucin. M. S. Kim and A. C. Ivy. *Jour. Am. Med. Assn.*, Nov. 21, 1931, XCVII, 1511-1513.

Fogelson found that from the gastric mucosa he could prepare a neutral mucin which had a high combining power for free acid. An ideal antacid, this does not markedly excite gastric secretion, is soothing or protective, and does not alter the body chemistry or disturb the gastro-intestinal tract. Under aseptic procedure a permanent biliary fistula was produced in twenty-seven days. A cholecystectomy was performed in all. The direct etiology of the ulcers following biliary fistula in dogs is unknown, the method having been used because of its simplicity.

Among the ten control dogs which received no mucin, ulcer of the duodenum developed in six, and three of the six had two ulcers. No ulcers developed in the seventeen dogs who received mucin with their food. On mucin, dogs with biliary fistula eat well and maintain their weight, which is not the general rule otherwise. On the basis of these observations, it is concluded that the administration of the mucin prevents ulcer formation in dogs with biliary fistula.

CHARLES G. SUTHERLAND, M.D.

Importance of Duration of Irradiations and Dose of Inoculated Virus for the Production of the Toxic Disease Caused by the Filtrable Tuberculous Virus in the Guinea Pig Irradiated with X-rays. M. Nasta, I. Jovin, and M. Blechmann. *Compt. rend. Soc. de Biol.*, June 30, 1931, CVII, 847, 848.

Following a previous investigation on the fatal toxic disease caused by the filtrable tuberculous virus in guinea pigs exposed to X-rays, the authors have endeavored to determine the number and minimal duration of the irradiations required to cause toxic phenomena in the experimental animals.

Six guinea pigs inoculated with 5 c.c. of filtered tuberculous urine were given a variable number (3, 2, 1) of exposures, lasting from 8 to 10 minutes each; two other animals were given only one exposure, lasting from 4 to 5 minutes. The interval between exposures was in general 5 days. The conditions of irradiation were identical in all the animals.

Of the two animals receiving 3 irradiations, one died after the second irradiation 8 days after inoculation, with a loss in weight of 70 grams; the other died after the third irradiation 12 days after inoculation, with a loss in weight of 120 grams. Of the two receiving two irradiations, one died in a

month, losing 120 grams, the other surviving. Of the two receiving only one irradiation, one died in 5 days, 7 days after inoculation, losing 90 grams; the other died more than a month after inoculation, losing 230 grams. Lastly, the two guinea pigs receiving only one irradiation with an exposure of only half the duration survived with a temporary loss of weight.

As demonstrated by these experiments, three exposures of the same intensity and duration were needed to produce fatal toxic results. It is true, however, that often the same results were obtained after one or two irradiations, these results depending evidently on individual differences in the animals (perhaps also on differences in toxicity of the virus employed), but these results are unusual, whereas after three irradiations death has been the uniform outcome.

In these animals, as in a number of others employed in previous experiments, the leukopenia occurring during the height of the toxemia reaches a level of from 5,000 to 6,000 leukocytes per cubic millimeter.

Regarding the importance of the dose of the inoculated virus, the authors have injected three groups of two guinea pigs each with 3, 2, and 1 c.c. of filtered tuberculous urine. The two animals inoculated with 3 c.c. and exposed to three irradiations both died one day after the last irradiation and 13 days after inoculation. The two animals inoculated with 2 and 1 c.c. have both survived after temporary loss of weight.

It follows from these experiments that the quantity of filtrable virus inoculated must not sink below a certain level in order to determine fatal toxemia.

HENRY BAYON, M.D.

Influence of Roentgen Rays on the Power of Fermentation of *Saccaromyces Cerevisiae*: Experimental Contribution to the Biologic Action of Roentgen Rays. Virgilio Gronchi. Bolletino dell'Istituto Sieroterapico Milanese, December, 1931, pp. 759-775.

From the results of numerous tests regarding the effect of roentgen rays on the power of fermentation of *Saccaromyces cerevisiae* in the presence of glucose, the author reached the following conclusions:

(1) Roentgen rays of 0.37 Å. and from 0.16 Å., in dosages of approximately 600 to 1,800 r, exert on the saccaromyces a functional stimulus, as shown by increased speed in the production of CO₂.

(2) This stimulus of excitation, other conditions being the same, is proportional to the radiant energy involved.

(3) With equality of dosage and under like conditions, the stimulative action is greater with hard than with soft rays.

W. W. WHITELOCK, Ph.D.

GALL BLADDER (NORMAL AND PATHOLOGIC)

An Effective Gall-bladder Stimulant to Supplant the Fat Meal. Lester Levyn. Am. Jour. Roentgenol. and Rad. Ther., December, 1931, XXVI, 904.

Experiments were conducted to determine the effects of the various ingredients of egg-yolk in an effort to find an effective gall-bladder stimulant which would leave the stomach rapidly, thereby allowing the prompt beginning of a gastro-intestinal opaque meal examination. Lecithin was shown to be the most active stimulant to gall-bladder contractions, and it was found that by mixing fresh egg-yolk (45 gm.) with glycerin (55 gm.) and then adding 2.5 gm. of lecithin dissolved in 3 c.c. absolute alcohol, a mixture is obtained which is not unpleasant to take. In the standard dose of 10 c.c. it serves as an effective gall-bladder stimulant, yet passes rapidly out of the stomach and does not retard gastric peristalsis if a barium meal is given immediately upon completion of the cholecystographic study.

J. E. HABBE, M.D.

GASTRO-INTESTINAL TRACT (DIAGNOSIS)

Gastrosopic Control of the Roentgen Findings in the Contour of the Gastric Mucosa. R. Schindler and H. Sielmann. München. med. Wchnschr., Nov. 20, 1931, LXXVIII, 1989-1991.

The articles of Berg, Chaoul, Forssell, and others on the roentgen visualization of the gastric mucosa are of great importance. Small carcinomas and superficial ulcers can be well outlined, but to obtain information on minute details, gastroscopy is far superior.

In three cases the contour of the mucosa was such that a carcinoma of the greater curvature near the cardia was diagnosed by means of the X-ray. Gastroscopy revealed only normal mucosa. The patients are well to-day.

A diagnosis of gastritis is often made by X-ray examination, but cannot be sustained by gastroscopy. Inasmuch as a carcinoma of the other parts of the stomach can be easily demonstrated by the relief method of Berg, the gastroscopic method has differed in only one out of seven cases. The roentgen findings were negative, but the gastroscope detected a secondary carcinoma near the cardia. In ulcer both methods have equal results. However, the authors are convinced that in gastritis the gastroscopic method gives more exact results than the roentgen method.

ERNST A. MAY, M.D.

Thoracic Stomach. A. Beutel. *Röntgenpraxis*, Jan. 1, 1932, IV, 40-46.

The author intends to classify the roentgenologic symptomatology of the "thoracic stomach" on the basis of cases reported in the literature and one case of his own. In this case two-thirds of the stomach was in the right chest, and the esophagus was very short. Symptoms which had been present since childhood suggested a congenital anomaly. An ulcer niche complicated the picture. A pneumoperitoneum might, in selected cases, be useful for the differentiation of the hernia contents and the demonstration of empty portions of the hernial sac.

H. W. HEFKE, M.D.

A Case of Pancreatic Stones Diagnosed during Life. Wilhelm Schöndube. *Röntgenpraxis*, Dec. 1, 1931, III, 1095-1099.

Only a very few cases of pancreatic stones have been diagnosed before operation. A carefully taken history and several laboratory tests should give the clue to a possible presence of this disease (pain in the upper abdomen, radiating toward the left, a Head's zone on the left).

The roentgenograms in a case described showed multiple calculi distributed through the upper abdomen in an arch-like fashion, the arch being open on the lower aspect. Barium in the stomach and duodenum showed the position of the stones as typical for the pancreatic region. Calcified mesenteric glands must be differentiated from them.

H. W. HEFKE, M.D.

The Mechanism of Gastric Evacuation. J. Earl Thomas. *Jour. Am. Med. Assn.*, Dec. 5, 1931, XCVII, 1663-1668.

There is quite general agreement on the main features of the gastric motor function. The characteristic motility of the stomach is a form of peristalsis, beginning as feeble contractions of the gastric musculature and furnishing the power which drives the chyme through the pylorus into the duodenum. There is definite evidence of opening of the pylorus with each wave of peristalsis.

Cannon found that chyme does not pass the pylorus at the approach of every peristaltic wave but occasionally, at irregular intervals. McCann was convinced that gastric evacuation depends on progressive relaxation of the pars pylorica, which he attributed to a change in irritability brought about by variations in the character of the gastric contents, chiefly digestion of protein. The character of the intragastric stimuli so far found to have an effect on the emptying process indicates that they are mainly concerned with delaying evacuation until a satisfactory degree of digestion has been attained. Available facts indicate that the principal function

of the pyloric sphincter is to furnish this resistance. Gastric evacuation occurs whenever the intragastric pressure near the pylorus exceeds the resistance due to the sphincter. Regulation results from stimuli due to conditions within the stomach and within the small intestine. The tonus of the pyloric sphincter is chiefly determined by stimuli affecting the stomach muscle as a whole. It serves as a constant resistance to the passage of chyme and blocks the exit of solid particles. By maintaining a narrow orifice it "filters" the gastric contents. By contracting when the duodenum contracts, it also limits regurgitation.

CHARLES G. SUTHERLAND, M.D.

Gastro-intestinal Allergy. Albert H. Rowe. *Jour. Am. Med. Assn.*, Nov. 14, 1931, XCVII, 1440-1445.

Gastro-intestinal symptoms in allergic patients have been noted by many observers. Food allergy probably produces more symptoms in the gastro-intestinal tract than in any other part of the body, because of the contact of foods with the tissues. It occurs most frequently in infancy and childhood and is apt to persist for many years. Edema of the mucous membrane and spasm of the smooth muscle produce disturbances in peristalsis and in function. Hepatic reactions are not infrequent. Allergic reactions in the urogenital tract, including the uterus, may also produce abdominal distress and pain. Symptoms may be immediate, delayed, or cumulative. Mild alimentary symptoms are undoubtedly more frequent than the marked or severe ones. Peptic ulcer in some patients may result from the action of digestive ferments in canker-like lesions in the gastric or duodenal mucosa.

Roentgen studies in 150 patients were negative, except for a spastic colon in twelve and moderate duodenal stasis in five. Roentgen studies with a milk vehicle for the barium are contra-indicated. When mild allergy is present, marked disturbance in function and peristalsis is apt to result.

Treatment consists of elimination of the specific foods productive of allergy. Desensitization to allergy-producing foods may occur in a few weeks or months with their total exclusion from the diet.

C. G. SUTHERLAND, M.D.

Common Anomalies of Duodenum and Colon: Their Practical Significance. Result of Eight Years' Combined Clinical and Roentgen Study. John L. Kantor. *Jour. Am. Med. Assn.*, Dec. 12, 1931, XCVII, 1785-1791.

This study covers an eight-year period of a consecutive series of private patients complaining of digestive disorders.

Duodenal bands represent anatomically the unabsorbed portion of the free edge of the lesser curvature and are variously called hepatoduodenal, hepatocolic or cystocolic ligaments, depending on the

actual course of the anomalous membranes. When the first portion alone is involved, various deformities of the cap are observed roentgenologically. Bands involving the second portion of the duodenum cause a characteristic roentgen appearance. The most common associated anomaly is a low cecum. Most of the bands in the right upper quadrant are undoubtedly of congenital origin. Acquired adhesions may also occur.

Redundant colon (dolichocolon) is one which is too long to fit into the body of the owner, without undergoing reduplication. The most common variety is an enlarged sigmoid loop. Two subvarieties are encountered often enough to receive the descriptive terms "double splenic flexure, with straight efferent loop" and "pelvic loop to the right." Kinks of the colon, presumably due to adhesions, are rather frequent. In many, the stomach is displaced or deformed, resulting in "cascade" or "retort-shaped" stomach.

High cecum is the result of arrest in embryologic descent, low cecum being the result of embryologic hyperdescent. The chief clinical aspects of each are discussed, and the general significance of digestive anomalies is summarized.

CHARLES G. SUTHERLAND, M.D.

GENITO-URINARY TRACT (DIAGNOSIS)

True Prostatic Calculi. Joseph A. Lazarus and Arthur A. Rosenthal. *Urol. and Cutan. Rev.*, February, 1932, XXXVI, 99-102.

A review of the literature revealed records of 370 cases of prostatic calculi, exclusive of the present series of 15 cases reported by the authors. It is believed, however, that many cases are not reported and that, therefore, this number is not a true index of the incidence of the condition. The introduction of roentgenography in routine urologic studies has shown it to be a rather common condition.

Prostatic calculi may be divided into the endogenous, or those calculi formed in the substance of the gland, and exogenous, which are formed in the urologic system and deposited in the prostate. The authors' series included only endogenous or true prostatic calculi.

The diversity of opinion regarding the etiology of prostatic calculi is an admission of failure in the discovery of the true causative factor. Sir Harry Thompson, in 1861, maintained that the corpora amylacea may under certain conditions lead to inflammatory changes within the prostatic acini, in which there occurs a deposition of calcium salts with the resultant formation of concretions. Trauma is believed to play an important rôle. Judd and Crenshaw are of the opinion that prostatic calculi result from a pre-existing prostatitis complicated by hyper-

trophy. In about 30 per cent of the cases, a positive history of gonorrhea is obtained. A pre-existing or existing infection within the gland in an individual who possesses a tendency to calcium deposits seems to the authors to be the most plausible cause for calculous formation in the majority of cases.

Prostatic calculi vary in size, consistency, and in their chemical constituents. The nucleus usually consists of an albuminoid substance, such as epithelial detritus, blood clot, a clump of bacteria, corpora amylacea, or necrotic tissue as a result of abscess formation. The surrounding laminated layers are made up of calcium phosphate, calcium carbonate, calcium oxalate, and ammonium magnesium phosphate. Most calculi are found in the lateral lobe and occasionally in the median lobe.

The symptoms of this condition in the order of their relative importance are as follows: Frequency; dysuria; perineal, penile, and rectal pain; urgency and tenesmus; hematuria; retention; impotencia, and hematospermia. Many calculi, particularly those deeply embedded in the gland, are asymptomatic and are accidentally discovered in a routine urologic study, with the aid of X-rays and digital examination. On digital examination a sensation of stony-hard substance, with crepitation, is diagnostic of this condition. Radiography, in addition to establishing the diagnosis, also indicates the position, size, and number of calculi present. Cystography will prove of value in cases in which it is difficult to ascertain whether the calculi are in the bladder or prostate.

Chronic prostatitis, with hard nodular inflammatory or malignant infiltrations, may often be mistaken for prostatic calculi, but cystoscopic and X-ray examinations usually suffice to make the differential diagnosis. Tuberculosis, with calcification of the prostate, often simulates prostatic calculi. In the case of tuberculosis, the associated involvement of other organs and the presence of tubercle bacilli in the urine aid in the diagnosis.

The treatment of prostatic calculi depends upon the presence of symptoms. In the symptomless case, surgical interference is contra-indicated and diathermy and massage are recommended. Suprapubic prostatectomy is the procedure of choice when an adenoma is found associated with prostatic calculi.

J. N. ANÉ, M.D.

Fibrin Stones of the Urinary Tract: Report of Two Cases. Neil S. Moore. *Urol. and Cutan. Rev.*, February, 1932, XXXVI, 90-93.

Fibrin stones of the urinary tract are considered by most authors to be a very rare condition. The first case was reported by Marcet, in 1817, and up to 1930, 26 cases, which were found at operation or autopsy, had been reported. The author describes two additional cases of this condition.

Fibrin stones have been thought to result from

blood clots, masses of coagulated inflammatory exudate, clumps of bacteria, and pus, or from true stones which have lost their mineral matter. Infection of the colon bacillus group is a constant finding in these cases. Ikoma considers faulty metabolism of great importance in the etiology.

The consistency of fibrin stones is that of putty. A definite capsule is usually present and the stones may be faceted. While the stones are more commonly found in the kidney pelvis in large numbers, they are occasionally encountered in the bladder, in which case they are fewer in number and larger in size.

Since fibrin stones are almost always accompanied by infection, the symptoms are those of pyelonephritis. Roentgenograms fail to reveal definite shadows of the stones; however, in one of the author's cases, negative shadows resembling gas bubbles were noted, and in Pedrosa's case, negative shadows were observed on the pyelogram.

The treatment is limited to either pyelotomy or nephrotomy. In the opinion of the author, nephrectomy is the operation of choice in those cases in which a normal kidney is present on the opposite side.

J. N. ANÉ, M.D.

Two Cases of "False Route" Determined by Urethrography. Italo Levi. *Archivio Italiano di Dermatologia, Sifilografia e Venereologia*, November, 1931, VII, 501-505.

Radiographic examination of the urethra is not only useful in many cases but even indispensable. Such cases include all forms of chronic blennorrhea, in which urethrography brings into evidence lesions not easily subject to diagnosis by other methods, both as regards affections of the urethra itself as well as alterations in the glandular adnexa. Frühwald was thus able in numerous cases of chronic blennorrhea to demonstrate small abscesses of the prostate which were not observable clinically. Indeed, the prostate appeared even normal under clinical examination.

The most positive indication for roentgenographic examination of the urethra is seen in cases of stricture, especially those resulting from gonorrhea, less frequently those of syphilitic origin. Urethrography furnishes an exact picture both of the nature and extent of the stricture, and reveals the eventual presence of numerous strictures at different points. In addition, the physician is made aware of the existence of so-called "false routes," into which the sound may penetrate, giving rise to serious disturbance, and even to hemorrhage. Determination of the existence of these "false routes" before employing the sound is of the greatest practical importance, and may lead to a complete change of treatment.

As regards harmlessness of the procedure, despite

the fact that a considerable quantity of lithium iodide entered the blood circulation, the author states that patients suffered no marked disturbance, beyond a pronounced metallic taste noticed immediately after the urethrography and persisting for several hours. Likewise, locally there were no inflammatory symptoms resulting from the lithium iodide.

W. W. WHITELOCK, Ph.D.

Renal Hematuria from the Standpoint of the Roentgenologist. Ira H. Lockwood. *Urol. and Cutan. Rev.*, February, 1932, XXXVI, 84-88.

The author emphasizes the importance of renal hematuria in the symptomatology of many genito-urinary conditions. Very often a patient complaining of hematuria is referred to a roentgenologist, and when no stone is found, the physician and the patient minimize the importance and gravity of this symptom. Also, because the bleeding is usually intermittent and of transitory nature, both are lulled into a condition of false security, and the opportunity for the early recognition of incipency is lost, irreparable damage resulting. While blood in the urine does not always mean the presence of organic disease in the genito-urinary tract, hematuria in any case should be considered always of sufficient importance to indicate a careful and thorough examination in an effort to determine the nature of the bleeding.

The sources of the bleeding may be considered as intrinsic and extrinsic lesions of the genito-urinary tract, systemic causes, and essential hematuria. The most common causes of renal hematuria are tuberculosis, calculus, infection, and tumors. The author reports five cases, which illustrate various sources of hematuria, and the diagnostic and therapeutic methods employed.

J. N. ANÉ, M.D.

Cholecystitis and Cystic Duct Obstruction: Significance in the Formation of Gallstones Rich in Calcium Carbonate and in Calcification of the Gall-bladder Wall; Preliminary Report. D. B. Phemister, Allan G. Rewbridge, and Hillyer Rudisill. *Jour. Am. Med. Assn.*, Dec. 19, 1931, XCVII, 1843-1849.

This is a review of seven cases showing the significance in the formation of gallstones rich in calcium carbonate and in calcification of the gall-bladder wall. The observation was made that in every case the cystic duct was obstructed by a cholesterol-bile pigment or cholesterol stones, indicating that the duct obstruction was a precursor to and a determining factor in calcium carbonate stone formation in the gall bladder. Following obstruction, calcium carbonate was thrown out in large quantities. It appears that the order of development of changes was: First, there was cholecystitis and cholesterol or cholesterol-pigment stone formation. Calcium car-

bonate and a trace of calcium phosphate were then excreted by the wall of the gall bladder, forming a semi-solid to soft white stone, incorporating other stones when they were present. The indications are that calcium carbonate stones are formed only when bile is excluded from the gall bladder by the obstructing stone, or when the amount entering is greatly reduced.

No explanation has been found for the selective excretion of calcium carbonate over long periods of time in such cases. The assertion that the calcium carbonate of all gallstones is proved out in connection with the mucin formed by the epithelium of the gall bladder is supported by the fact that calculi are occasionally found in the salivary ducts and pancreas, where there is also mucous secretion.

C. G. SUTHERLAND, M.D.

A New Case of Double Ureter. Pedro Moreyra Bernan. *La Prensa Méd. Argentina*, Dec. 20, 1931, XVIII, 939-946.

Abnormalities of the kidney and ureter, which are frequently encountered, may be the cause of functional disturbances and may modify the symptoms and diagnosis of renal lesions. For that reason, the author gives a review of the different abnormalities, particularly of the ureter. He then proceeds to present the case of a woman, 25 years of age, who came to him sixteen months after giving birth to a child. She complained of backache and pain after urination. These symptoms had not caused much discomfort until three months prior to admission to the hospital, when they gradually became aggravated. There was blood after urination, which occurred five times nightly. On physical examination, there was found tenderness all over the abdomen but particularly over the right kidney region and the left iliac fossa. Cystoscopy revealed two distinct ureters on the right side of the trigone, one higher than the other; urine was collected from the one on the left. A pyelogram was made and the two ureters were found to be independent in their courses from the kidney to the bladder.

In this case, a correct diagnosis could not possibly be made on the symptoms, which pointed to a chronic pyelitis and cystitis. The pain in the right renal area was probably caused by a mild degree of hydronephrosis in the inferior pelvis. The patient improved rapidly by means of cystoscopies and lavage of the two right kidney pelvis with silver nitrate.

N. G. GONZALEZ, M.D.

The Significance of Hematuria, with Special Reference to Early Diagnosis. William J. Wallace. *Urol. and Cutan. Rev.*, February, 1932, XXXVI, 79-82.

Hematuria is often the first evidence of major pathology in the genito-urinary tract and may precede subjective and physical manifestations by many

weeks, months, or years. While the causes of hematuria are numerous, the vast majority can be traced to one of the following: Inflammation; tuberculosis; calculus; newgrowths, and trauma. Blood is also found in the urine in many systemic diseases and as the result of poisoning by certain chemicals.

The discovery of the cause of hematuria and the diagnosis of the primary condition require a careful and complete study of the individual case. The family history is of considerable importance, for conditions such as hemophilia, tuberculosis, blood dyscrasias, purpura, or cancer may be disclosed. The personal history should be complete in regard to previous systemic conditions in general and to genito-urinary inflammatory diseases, trauma, and abnormalities in particular. The age and occupation of the patient should always be recorded. The character of the bleeding is a very significant part of the history, and its mode of onset, duration, frequency, amount, and the presence or absence of associated pain should be carefully considered.

The physical examination should be complete with careful attention to every detail. Rectal examination should be made in every case and the prostate carefully examined in all male patients. Vaginal examination and palpation are of equal importance in females. Pathologic involvement of the tubes, ovaries, or uterus can be thus investigated.

Endoscopic examination should be the next procedure in cases of hematuria. The author believes that this procedure can be rendered practically painless by giving sodium amytal by mouth half an hour previous to commencing. This is followed by urethral instillation of a dependable surface anesthetic. After thorough endoscopic examination, the cystoscope is substituted for the endoscopic instrument. X-ray catheters are passed then to the renal pelvis on either side, and a specimen of urine collected from each side. Functional tests should be made to obtain additional information regarding the state of each kidney. Thereafter, a roentgenogram of the entire urinary tract should be made, and this followed in turn by a pyelographic examination. A third exposure is advised, with the patient in the semi-erect position and the opaque catheters partially withdrawn until their tips are about an inch above the ureteral orifice. In the opinion of the author, intravenous pyelography should not be depended upon alone, but should be employed merely as a check for retrograde pyelography.

J. N. ANÉ, M.D.

GENITO-URINARY TRACT (THERAPY)

The Basis for Management of Ureteral Calculi: Based on the Study of Five Hundred and Sixty-five Cases. Ralph L. Dourmashkin. *Jour. Am. Med. Assn.*, Jan. 23, 1932, XCVIII, 276-283.

This series represents 589 stone problems. A

stone may be lodged in a ureter for a considerable length of time without seriously hampering kidney drainage and without producing pelvic infection or extensive changes, marked by hydronephrosis or a chemical pyelonephritis. The routine injection of opaque solutions into the renal pelvis in the presence of ureteral obstruction should always be regarded as a procedure pregnant with dangerous possibilities. With the advent of intravenous pyelography a new, practically harmless medium for obtaining information, regarding changes taking place above the obstructing stone, immediately has become available. In addition, it determines the all-important fact relative to maintenance of renal function. Temporary cessation of renal function may produce a total absence of the dye shadow in the affected side. These should not be mistaken for cases of serious renal obstruction. An indwelling catheter will, as a rule, quickly restore the *status quo* of renal function.

C. G. SUTHERLAND, M.D.

GRENZ RAYS

Grenz-ray Therapy. Alfred Reisner. *Röntgenpraxis*, Jan. 1, 1932, IV, 7-10.

A critical study of the value of the Grenz rays is possible only when one confines oneself to the publications which are based on exact measurement of quality and quantity of the radiation. The author uses 0.02 mm. Al half value layer, 10 kilovolts, and 10 ma.; the distance is 10 cm. in localized, and 15 cm. in general, irradiation. A single dose of 5,000 r did not cause epilation.

The question of their separation in biologic action from ultra-violet and roentgen rays is not settled. Treatment of superficial diseases of the skin has been greatly improved by the utilization of these rays. Even if X-rays and Grenz rays lead to the same improvement, the Grenz rays ought to be preferred, because the deeper tissues are not affected by them. Superficial nevi can be made to disappear. Tuberculous diseases of the skin require high doses. Carcinoma of the skin should not be treated by Grenz rays, but by roentgen and radium rays. The general action of Grenz rays on the entire body, used in generalized skin diseases and internal diseases, has not been definitely proven as yet in the author's opinion.

H. W. HEFKE, M.D.

Grenz-ray Therapy in Dermatology. E. Lachmann and L. Loewenstein. *München. med. Wchnschr.*, Oct. 16, 1931, LXXVIII, 1793-1795.

The authors give a general view of the physical properties of the Grenz rays and of their indications. The rays are a valuable addition in the therapeutic armamentarium of the dermatologist.

E. A. MAY, M.D.

GYNECOLOGY AND OBSTETRICS

Renal Pelvis and Ureteral Changes during Pregnancy. F. Carreras, F. Faixat, and I. Figueras. *Rev. Méd. Cubana*, January, 1932, XLIII, 75-81.

A previous piece of work on this subject gave the authors the thought that there must be some changes taking place in the kidney pelves and ureters during pregnancy. These changes, the authors believe, are predisposing factors in the causation of pyelitis, which is reported in the literature to occur in from 40 to 66 per cent of the cases of pregnancy, varying according to the author reporting. Most of the authors report the condition as occurring more frequently on the right side. Kretschmer and Heaney believe it occurs in from 80 to 85 per cent of cases. By means of cystoscopy, ureteral catheterization, and pyelography, Carson reports that the capacity of the right ureter changes from 13 c.c. to 100 c.c., and the left side increases to 80 c.c. during pregnancy. The changes found at examination and at autopsy are: Dilatation, change in course, strangulation, and kinking.

The changes in position are due to a compression of these structures by the uterus. With normal fetal position, there is an increase in pressure to the right, which accounts for the more frequent changes on this side. The authors have also noted a change that varies from a constriction to a kink, which is usually found just a few centimeters below the kidney pelvis. This they believe to be due to a compensation, with the dilatation below.

The compression of the ureters against the innominate line is not recognized by the authors, but they are of the same opinion as Beaufond, Porcher, Legueu, and Vaudescal, namely, that it is due to a lack of contractility of this part of the ureters. This is more evident when one considers the changes in texture of the ureteral walls. There is a definite rigidity of the walls produced by an increase in tissue of a non-contractile nature. A hyperplasia of the walls is also observed.

In the technic of this study the authors used uroselectan exclusively, because the drug is excreted entirely by the kidneys. After describing the composition of and mechanics of the action of uroselectan, they describe their technic in detail. In doing uroselectan pyelography the authors recommend the following: The colon must be thoroughly clean, as when exploratory pyelography is done. They use 30 gm. of the drug dissolved in 100 c.c. bidistilled water. After this solution is sterilized in the autoclave, it is injected intravenously either by means of a syringe or by the Murphy drip. The drug is injected slowly, but not so slowly as when gall-bladder visualization is done. The authors take from 10 to 15 minutes to inject the solution. In this way, they have not experienced much reaction. The only complaint that patients have made is of a burn-

ing sensation locally and along the course of the vein. This sensation—thought to be due to a local action of the drug on the endothelium—has disappeared when the injection is stopped. The authors do not recommend prolonging the time of the injection because of the rapid elimination of the dye by the kidneys. They report the best results when the films are exposed from 10 to 15 minutes after the end of the injection.

In order to obtain good pyelograms it is necessary that the renal function be good. The intensity of the pyelogram depends directly upon the renal function. When there is a lesion of the kidneys bilaterally, the shadow either is opaque or does not show at all. Naturally the intensity of the shadow depends on the concentration of the dye in the urine, a concentration of at least 5 per cent being necessary for good results. When sodium bromide is used, a concentration of 20 per cent is required. If there is an obstruction to the urine flow, the shadows above this obstruction will be more intense because of the urine concentration. Another point in favor of uroslectan is the fact that when it is used the urinary tract is studied in its normal physiologic condition. This is not true of the catheter method of pyelography. When one compares the intravenous with the catheter method, one cannot fail to favor the former.

By means of the above method the authors have found the following changes to occur:

- (1) Obstruction to the urine flow at the level of the innominate line. This they believe to be due to the uterine compression on the ureters as they cross the pelvis.

- (2) Dilatation of the ureters above the compression. This they attribute to the retarded flow of urine.

- (3) There is a compensatory change between the two ureters. When one is dilated, the other is found to have a smaller diameter in proportion.

JOSEPH MALDONADO, M.D.

Six Hundred Hysterosalpingographies: Diagnostic Errors and Dangers. Günter K. F. Schultze. *Röntgenpraxis*, Dec. 15, 1931, III, 1105-1108.

Of 600 hysterosalpingographies, 250 were checked by surgery and 200 by repeated examinations. Technical errors were responsible for 90 per cent of all wrong diagnoses; they consisted of too small a filling (too little lipiodol) or too large a filling, the examiner having neglected to watch the injection with the fluoroscope and to take a roentgenogram twenty-four hours afterwards. The percentage of diagnostic errors naturally decreases with the technique and experience of the examiner. A correct diagnosis, as far as the patency and pathology of the tubes is concerned, may be made in over 90 per

cent of cases. The diagnosis of a myoma of the uterus can be made in over 80 per cent of all cases, and of ovarian tumors in only about 50 per cent. In 8,300 hysterosalpingographies, done with iodized oils, and reported in the literature, three deaths and 30 inflammatory complications were reported. The actual percentage of harmful sequences is probably greater. No deaths took place in this series, and inflammatory complications were seen five times, which, however, did not lead to permanent damage.

To avoid complications one should make a careful selection of cases, should examine in the middle menstruation cycle, and should use lipiodol as contrast material. The injecting should be done under the fluoroscope, no intra-uterine instruments being used, and no force being employed. The amount of oil should be as small as possible and the uterus should be emptied. After the examination, bed-rest should be advised. If these points are remembered and followed, this method gives very satisfactory results.

H. W. HEFKE, M.D.

Hysterosalpingography as a Help in Gynecology: A Roentgenologic and Clinical Study. S. W. Leibow and Dm. Goldstein. *Röntgenpraxis*, Jan. 1, 1932, IV, 16-31.

The authors review 61 hysterosalpingographies which they had performed. This method is very valuable, giving information about anatomy and function of the uterus and tubes. The diagnosis of gynecologic diseases is made clearer by it, and anomalies of the uterus might be graphically demonstrated.

The peristalsis of the tubes seems to take place in three ways, wavelike, pendulum type, and the "ballstring" type. An early pregnancy can be shown, but the method should, at present, be used only in cases in which a therapeutic abortion is indicated. Repeated films, taken at not too long intervals, seem necessary in order to show a spasm of the tubes. If such spasm of the uterine end of the tubes is suspected, only a small amount of lipiodol or iodipin (about 2 c.c.) should be injected under low pressure.

The advantage of lipiodol injection over Rubin's air test is that it shows much more than only the patency or occlusion of the tubes. Surgery seems indicated only when the abdominal end, not other portions, of the tube is occluded. If one irradiates the ovaries without effect, this method can locate the ovary. It can be done without danger very easily, if technically correct and with the right indication, without confining the patient to the hospital. There will probably be many more facts found by its use in anatomy, physiology, and pathology of the uterus and tubes.

H. W. HEFKE, M.D.

HEART AND VASCULAR SYSTEM (DIAGNOSIS)

Multiple Aneurysms of the Aorta in a Six-year-old Girl. M. Acuña, P. Winocur, and G. Oroscó P. *La Prensa Méd. Argentina*, Nov. 20, 1931, XVIII, 788-795.

This is undoubtedly a very interesting case because of the age of the patient. The family history was suggestive of syphilis. The patient, a six-year-old girl, was always weak. Three months prior to her visit to the authors, she had edema of both ankles, which disappeared after two weeks in bed. Shortly afterward, it was noticed that she was failing in health, had become pale, and developed edema of the feet and ankles, accompanied by urinary disturbances. Physical examination revealed an enlargement of the mediastinum, heart, and liver, tachycardia, and a flattening of the tips of the fingers. The Wassermann reaction was weakly positive. A radiogram of the chest showed an enlarged globular heart. The patient started suffering with a dyspneic attack and died twenty-seven days later. At autopsy the following conditions were found: Multiple aneurysms of the aorta; dilatation of the heart; sclerosis of the auriculo-ventricular valves and of the parietal endocardium, and syphilis of the aorta and pulmonary arteries.

N. G. GONZALEZ, M.D.

Aneurysmatic Persistence of the Arterial Canal and Aneurysmatic Dilatation of the Pulmonary Artery. Carlos Rodríguez and Antonio Battro. *La Prensa Méd. Argentina*, Dec. 30, 1931, XVIII, 986-995.

The authors present this case because of its rarity, and also to show the successful results obtained by clinical studies aided by the X-ray. The case here given was of a woman, 27 years of age, who since childhood has been seized with nocturnal epileptiform attacks. When three years old, she was examined by a physician who stated that she had a murmur over the heart. At twelve years of age, she was examined again and the murmur was not found. She was in perfect health until four years ago, when she started complaining of shortness of breath either while resting or exercising, hemoptysis, and pain over the right shoulder.

When examined by the authors, she was found markedly short of breath, and there was present cyanosis of the lips and conjunctiva on the slightest exertion. In the heart, the first sound was found to be blurred in character, while the second was accentuated. A radiograph showed a rare and peculiar heart shadow, the right border being formed in its superior part by the vertebral column and at its lower part by a rather pronounced arch, corresponding to the right auricle. On the left side, there

is observed an arch which runs upward and outward and extends from the second to the fourth intercostal space, where it becomes continuous with the heart shadow. The heart seems to have been displaced to the left so that it almost touches the lateral chest wall, being rotated to that side. There is also seen a light shadow which seems to separate the inferior border of the heart (right ventricle) from the superior border of the right diaphragm. Several radiographs were taken in different positions and the same shadow of the middle arch was noticed.

By a process of elimination, the diagnosis rested upon aneurysm of the pulmonary artery. The X-ray findings did not warrant that diagnosis, so the authors concluded that they were dealing with an aneurysmatic dilatation of the pulmonary artery and an aneurysmatic persistence of the arterial canal.

N. G. GONZALEZ, M.D.

HODGKIN'S DISEASE (DIAGNOSIS)

A Contribution to the Question of Lymphogranulomatosis of the Lungs (Roentgenologic Diagnosis and Treatment). W. N. Bobretzkaja and J. B. Porchownik. *Röntgenpraxis*, Nov. 15, 1931, III, 1034-1045.

Ten cases of involvement of the lungs by Hodgkin's disease are described. In five cases a biopsy had been done, in one an autopsy and in the other four the clinical picture was so typical as to exclude other diseases. Invasion of the lungs in this disease is not infrequent.

The pathologic changes consist in: (1) Specific granulomatous growths, and (2) non-specific secondary changes (compression of bronchial walls, atelectasis, etc.). The roentgen picture is various and not typical; all the signs usually evidenced by other tumors may be present, such as invasion, compression, metastasis, and chronic inflammatory processes. The roentgen examination alone does not allow a diagnosis in many of these cases, and a roentgen appearance of a malignant tumor of the lungs does not always exclude Hodgkin's disease.

A biopsy is indicated if glands are present; otherwise a trial series of roentgen treatments, which usually leads to a quick positive effect, is recommended. The treatment should be done carefully so as to avoid a general reaction. Lymphogranulomatosis of the lungs in the terminal stage is influenced very little.

H. W. HEFKE, M.D.

THE JOINTS

Present Concept of the Surgical Pathology of the Hip in Infancy. Oscar R. Maróttoli. *La Prensa Méd. Argentina*, Dec. 30, 1931, XVIII, 999-1007.

This subject is of great importance, not only to

the specialist but also to the general practitioner. Lately, there has been great progress made in osteo-articular surgical pathology, with predilection to the coxofemoral articulation, but this knowledge has been imparted only to the specialist. Sometimes, the diagnosis of an infectious process is made, but the family is restless; a complete clinical and radiologic examination is made and syphilitic osteitis diagnosed, thus changing the whole treatment.

Since this subject is so extensive, the purpose of the author is to present certain fundamental conditions, such as the classification of the diverse syndrome of the hip and the corresponding physiopathologic conclusions. He then presents the teachings of Allison, concerning articular pathology and physiology. He believes that the advent of the X-ray broadens the horizon of medicine, particularly in the pathology of bone. Here, it brought to light new entities or corroborated previous findings. From 1908, when Köhler advanced the matter of epiphysitis, through Perthes, who described osteo-arthritis deformans juvenilis, up to the present, our knowledge has been gradually increasing. The author then discusses the classification of such conditions and concludes that the clinical findings are of no importance in comparison with those of the X-ray.

N. G. GONZALEZ, M.D.

Meniscitis of the Knee Joint: Extracondyloid Luxation. Ricardo Finochietto and Augusto A. Covaro. *La Prensa Méd. Argentina*, Dec. 10, 1931, XVIII, 901-904.

Usually a severed meniscus has the tendency to have its free part in the intercondyloid space. The purpose of this paper is to present three observations in which the position adopted by the fractured cartilage was completely the opposite, the free portion of the cut meniscus being outside the surface of the interline, thus forming a true extracondyloid luxation. The first case, a boy 17 years old, fell down in forced left genu valgum. There was great pain in the posterior part of the knee and, later on, tumefaction and other symptoms of meniscal lesion. This type of accident happened three times to the same patient. He was operated on, diagnosis was confirmed, and damage repaired.

The second case, a man 22 years old, while playing football had his left leg in forced flexion. He felt severe pain which was followed later by tumefaction. The same accident happened twenty days later. The identical condition as above was found on operation.

The third case, a man, 20 years old, while playing football, was hit by the foot of another player on the left popliteal region. He fell down with his leg flexed. There was severe pain in the whole articulation, but within twenty minutes it disappeared.

On examination, there was felt a small posterior tumefaction. He was also operated upon and diagnosis confirmed. The authors conclude their paper by presenting a radiograph of the third case and stating that the two outstanding symptoms are (1) tumefaction of the internal side of the articulation and (2) the "jump sign" of the meniscus (movement of the meniscus when caught between the examining finger and the bone).

N. G. GONZALEZ, M.D.

NERVOUS SYSTEM (GENERAL)

Radiotherapy of the Sympathetic System in Certain Cardiovascular Affections. L. Delherm and Henri Beau. *Jour. d. Rad. et d'electrol.*, July, 1930, XIV, 391-401.

Observations on the successful treatment of seven cases of Raynaud's disease were made. In all these cases the cervicodorsal region was irradiated; however, recently peripheral irradiations have been employed with success. Only one case of obliterative arteritis is reported. Considerable improvement occurred after irradiation of Scarpa's triangle and the popliteal space. Successful cases treated by others are noted.

Radiotherapy in Raynaud's disease not only stops the local asphyxia but also causes a cicatrization of the ulcers. Capillary circulation improvement is most marked in recent cases, but not rarely is improvement seen in older ones. When scleroderma accompanies this condition, one can observe the loosening of the derma.

This treatment causes a cessation of the spasm and dilates the collaterals so that the claudications stop, pain is relieved, and the color and temperature return to normal. Positive reaction to a hot foot bath is a good prognostic sign of the efficacy of the treatment. A negative reaction calls for a guarded prognosis.

For the upper extremities, irradiation should include the cervicodorsal region to the second dorsal vertebra for the lower extremities, the region from the tenth dorsal to the second lumbar vertebrae. It is advisable also to irradiate areas all along the vessels of the limb. Two symmetrical fields on each side of the vertebral column. F.S.D. 25 cm.; filter Al=5 mm.; 400 r at each application; 3 applications a week, from 1,200 to 1,600 r per series a week with at least three weeks' rest after each series. For the irradiation of the extremities it is logical to reduce the filtration (to 2 mm.) and the voltage as well. An attempt is made to explain the action of the X-ray and its effect on the sympathetic system and not on a modification of the suprarenal secretion. The action is thought to be due to its inhibitory effect on the intermedio-lateral tract and its

cerebral ganglions, also the small perivascular ganglions.

There follows a review of the cases of angina pectoris, reported in the literature as treated by irradiation. Three cases are added in which the intensity and frequency of the pain were lessened after irradiation. The same technic as given above was used except that the irradiation was given over the heart and aorta from the back and anteriorly.

B. J. DELAUREAL, M.D.

RADIATION

Concerning the Question of the Distribution of Roentgen Intensity in the Body during Deep Therapy. Part III.—Measurements with the Photographic Method. M. Dorneich. *Strahlentherapie*, March 9, 1932, XLIII, 441-489.

The author has continued his studies concerning "isodoses" and presents in this paper the results of investigations dealing with the development of a reliable photographic method (See *Strahlentherapie*, 1930, XXXVIII, 491; 1931, XLII, 56). The apparatus used is described in detail and the possible sources of error are carefully considered. A few examples of the obtained isodose charts are shown, and their general characteristics are discussed. It appeared that the results of Dessauer's and Vierheller's work (1920) could be confirmed, with the exception of minor deviations. In another article which is to follow soon the entire set of "standard isodose charts" will be published.

ERNST A. POHLE, M.D., Ph.D.

Radiotherapy of Blood Diseases. G. Bignami. *Strahlentherapie*, Jan. 9, 1932, XLIII, 43-67.

This is a translation of a report presented by the author before the Ninth Italian Congress on Medical Radiology, in Turin. He discusses in great detail all phases of a field which offers many puzzling problems to the radiologist. All types of leukemia and aleukemia, erythrocythemia, lymphogranulomatosis, Gaucher's disease, Mikulicz's disease, chloroma, myeloma, lymphosarcoma, and purpura are discussed. Strict individualization must be regarded as the supreme rule in radiation therapy of blood diseases. In leukemia small or moderate doses seem preferable; if the white count has dropped to about 25,000, an interval in the treatment is usually indicated. Higher doses are recommended for both

polycythemia and Hodgkin's disease. It must be admitted, however, that many radiologists obtain excellent results in lymphogranulomatosis with moderate doses. In purpura the irradiation of the spleen with high doses and of the bones with small doses seems indicated. Pernicious anemia does not respond, in the author's opinion, to radiation therapy.

ERNST A. POHLE, M.D., Ph.D.

The Treatment of Chronic Leukemia. Franz Bardachzi, Richard Epstein, and Ernst Fiedler. *Med. Klinik*, Nov. 13, 1931, XXVII, 1671-1674.

The technical progress in radiology has been so great that difficulties in applying the desired dose and intensity of X-rays do not exist to any extent. A statement, which is often found in the literature, to the effect that the life of a patient with leukemia is not prolonged, must be corrected. Not to advise roentgenotherapy in these cases is a mistake, which, unfortunately, is still made by some physicians. The authors report 26 cases of myelogenous leukemia and 9 of lymphatic leukemia. In myelogenous leukemias the spleen, bones, liver, or the entire body may be exposed to the X-ray. In previously untreated cases irradiation of the spleen alone is usually sufficient. Serial blood examinations give the indication for the type of treatment. Small repeated doses seem to be tolerated better than larger ones. General reaction must be avoided. An initial dose of one-fourth of an erythema dose is often too large (180 K.V. effective and a filter of 0.5 mm. Cu and 1 mm. Al were used). The bones should be irradiated only if the response to splenic irradiation is not marked enough. When the white cells reach 20,000, the treatment should be interrupted. The Teschendorf method of irradiating the entire body, with very small doses and from long distances, seems to give good results in otherwise resistant cases. Irradiation is contra-indicated in the terminal stages. The lymphatic leukemias are treated by softer rays and the bones are not exposed. The localized glandular masses are irradiated by comparatively soft rays in order to avoid damage to the blood-forming organs.

The skeptical view taken by many physicians, as far as the radiologic treatment of leukemias is concerned, is not justifiable, but the task of choosing the right technic for each individual case still remains to be settled.

H. W. HEFKE, M.D.

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